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No. 001

Coal bed 3D modeling based on Set Theory and unparallel ATP

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ABSTRACT

Although spatial objects of our world have an intrinsic three dimensional (3D) natures, 3D data modeling and 3D data management have so far been neglected in spatial database systems and Geographical Information Systems, which map geometric data mainly to two-dimensional abstractions. But increasingly the third dimension becomes more and more relevant for application domains. Large volumes of 3D data require a treatment in a database context for representing, querying, and manipulating them efficiently. After detailed researching on the mechanism of Modeling of the Geology Body, a new compositive data model is brought forward based on the joining of set theory (for short ST) and Unparallel Analogical Triangular Prisms (for short UATP). Spatial entity is decomposed into five fundamental kinds of data types in this model, including 3D point (3DP), 3D line (3DL), 3D sample surface (3DSS), 3D surface (3DS), and 3D volume (3DV). Meanwhile, nine data structures concerned are put forward, including node, TIN edge, side edge, arc edge, TIN surface, sample surface, quadrangle, UATP, and 3DSVC. Based on this, system of modeling and simulation for spatial entity are designed. Fault and mining roadway are presented as examples. This paper aims at investigating the complex inherent features of 3D data and presents an abstract, formal data model called ST (Set Theory). The data model comprises a set of three-dimensional spatial data types together with a collection of geometric set operations. The result shows that the data model based on set theory and UATP can improve speed and accuracy degree during process modeling. So, the main point in this paper is reconstruction of 3D Geological models, other question, such as: topological relations, data volumes as a key question for further study.

Keywords: Set Theory, Unparallel Analogical Triangular Prisms, 3D Spatial Data Types, Spatial Database, Coal Bed

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No. 002

Topological spatial relation calculation in constrained Delaunay triangulation: an algebraic method

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ABSTRACT

Topological spatial relation between spatial objects is a very important topic for spatial analysis, query and reasoning in Geographic Information Science (GIS). In this paper, an algebraic method using constrained Delaunay triangulation (CDT) for topological spatial relation is presented. In the part of foundational theory, (i) prove CDT is simplicial complex in $\mathbb{R}^2$. (ii) import chain structure in CDT and prove including & approximating theorem and reduced including & approximating theorem, and are used for estimating left, middle and right side properties of triangle. (iii) define the region in CDT and establish region algebra (RA), which use the set of region as computational space and use the intersection operator as a binary operation. (iv) describe basic forms of node and chain which are contained in a set of triangles. In the part of spatial relation calculation, (i) describe spatial object as three entries, i.e. exterior, boundary and interior, with left, middle and right of triangle and their combination. (ii) establish the topological spatial relation calculation model-region nine intersection model (R9IM), which is used the intersection operation and the form operation as basic operations. (iii) calculate thirty-three spatial relations of simple objects with R9IM in the practice application of topological examination.

Keywords: Topological spatial relation calculation; constrained Delaunay triangulation; region algebra

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No. 003

Expanded Q4 Quality Assessment for Pan-Sharpened MultiSpectral Image

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ABSTRACT

In this paper, we took into account both the spectral information and the spatial information and estimated how well the needed information contained within the multispectral (MS) and panchromatic (PAN) images was represented by the pan-sharpened image. Based on that, we proposed a new quality index which could be seen as an expanded index of the global quality measurement Q4. In our method, we first measured the spectral information preserving quality between the MS image and the fusion result. Then, we constructed a virtual spatial detail image considering the spatial resolution ratio between the source MS image and the PAN image, and also extracted the detail image contained in the merged image using the same technology, followed by a spatial information preserving quality index calculated from these two detail images. At last, we integrated the two indices by means of weighted addition determined by fusion model. To illustrate the superiority of this new index, we took experiments on two pairs of ZY-2 PAN and ASTER MS (1 2 3 bands) remote sensing imageries, and adopted the tradeoff FIHS fusion method in which the tradeoff parameter was set to different values standing for different fusion models. After using the proposed index to assess the quality of fusion, we think that the new index is compliant with subjective evaluations and could therefore be used to compare different image fusion or to find the best parameters for a given fusion model. Finally, we gave an experiential weight parameter of the quality index while assessing the tradeoff FIHS fusion with images from these two sensors by the author's experiments.

Keywords: pan-sharpen, non-reference quality assessment, fusion model, quaternion algebra, weight parameter

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No. 005

Assessments of Hangzhou urban growth near the Xixi wetland using remote sensing data

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ABSTRACT

This study has demonstrated that quantification of subpixel percent imperviousness over time provides a good estimate of urban LCLU change. Furthermore, the combination of Landsat satellite data and high-resolution Quickbird imagery provides the necessary spatial information needed to support subpixel impervious change detection. Subpixel percent imperviousness mapping also provides more information on the spatial extent and intensity of urban LCLU change. This approach provides considerable flexibility in capturing the heterogeneity of urban landcover characteristics. Quantification of urbanization through mapping impervious surface change provides useful data for urban dynamic simulation including model calibration and validation. Regrouped and categorized sub-pixel ISA data to remove uncertainties for a small portion of total ISA pixels was performed. After regrouped and categorized sub-pixel ISA data to remove uncertainties for a small portion of total ISA pixels, the model was used to simulate the historical development of impervious surfaces in the Hangzhou. After the calibration process, the best parameters that matched current and historical growth patterns were selected from different urban density change predictions. The model was then used to make analyze of impervious surface. The results showed lower density urban development to be widespread throughout the wetland, whereas much of the medium to high-density urban development have occurred in proximity to existing urban centers.

Keywords: Urban; Remote sensing; Assessments; Impervious surface

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No. 008

The conjugated evolvement of land use change with landscape pattern based on RS/GIS in watershed scale: A case study of middle and lower reaches of the Hanjing Basin

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ABSTRACT

The conjugated evolvement between land use/cover change (LUCC) and landscape pattern are appeared as their relevancies in space-time scale. In this paper, the data resources are combined the conventional maps and statistics with two temporal TM images in the middle and lower reaches of the Hanjing Basin in 1995 and 2000, and the system analysis are made to the coefficient of land use intensity (the COLUI), composite index of landscape pattern (the CILP), and their changes. The platform of spatial data processing is software ERDAS and ARC/INFO, and the attribute data are calculated with software ACCESS, EXCEL and SPSS. The results of statistical and correlation analysis show the rules of conjugated evolvement between LUCC and landscape pattern, that is, there is a remarkable negative correlation between the COLUI and the CILP in this region. In 1995, the correlation coefficient between the COLUI and the CILP is -0.572 with the confidence level 0.01, it means that the probability of negative correlation is 99%. In 2000, this correlativity is increased, the correlation coefficient is -0.683 with the confidence level 0.001, meaning that the probability of negative correlation between the COLUI and the CILP is 99.9%. The spatial analysis shows that the correlativity is associated markedly with relief types in spatial distribution in the study region. The correlativity between the indexes in the plain and mountainous regions is higher than in the hilly county, meaning that the land use structure and landscape pattern are illogicality. In the hilly county, the COLUI and the CILP are high, but the correlation is illegibility, meaning that the land use structure and landscape pattern are in reason. The temporal analysis shows that the degree of correlation is trended to increase with time.

Keywords: coefficient of land use intensity, landscape pattern, correlation analysis, spatial analysis, conjugated evolvement, watershed scale

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No. 009

Linguistic characteristics of topographic map symbols

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ABSTRACT

The use of linguistic model in spatial information has been an important topic discussed in relevant theoretical domain in recent years. On the basis of analyzing the geometrical composition of large-scale topographic map symbols and the geometric and semantic relationships among symbols, system of topographic map symbols was regarded as a two-dimensional graphic language and methods and theories of the linguistics were applied in cartographic language. The characteristics of topographic map symbols were analyzed, the internal structure and constructional rule of topographic map symbols were researched, and the phonetic and semantic structures of topographic map symbols were discussed.

Keywords: symbols, cartographic language, topographic maps, phonetics and semantics

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No. 011

Simulation of the change of regional ecosystem services value based on CA-Markov

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ABSTRACT

During the last few years, the value of ecosystem services, the possibilities and rationalities of evaluating these services have attracted interests of many ecologists and economists. However, the dynamic change of ecosystem services is less studied. In this paper, the dynamic simulation method (i.e.CA-Markov) is used to simulate the change of ecosystem services value in research area. The main objective of this study is to give comprehensive and reasonable assessment of the ecosystem services value change in the research area which would provide scientific basis for environment, ecosystem construction and strategic decisions. Based on the remote sensing dada of year 1992 and 2003, the landscape information of research area is obtained, and the transfer matrix among various landscapes is calculated during the period, then the data of landscape of research area in year 2015 is predicted using the model of CA-Markov. Then the change of ecosystem services value is calculated based on the value coefficient of various landscapes. The research demonstrates that the CA-Markov is a good tool for simulating the change of ecosystem services value. The studied result can provide scientific basis for ecosystem construction and strategic decisions.

Keywords: Ecosystem services value; Markov; cellular automata; landscape

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No. 013

Monitoring interannual variability of vegetation in the western Liaohe River Basin, Northeast China

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ABSTRACT

Because vegetation affect several processes including water balance, absorption and reemission of solar radiation, latent and sensible heat fluxes, and carbon cycle, the variations in the composition and distribution of vegetation represents one of the most main source of systematic change on local, regional, or global scale. To monitor and better assess natural or man-made change in vegetation of the earth is desirable for modeling and predicting interactions between land surface and atmosphere. The temporal evolution of decadal NDVI composition is regarded as an effective time window able to show the natural seasonal variations. This paper investigates vegetation change between 1998 and 2006 in the west Liao River watershed, North China, which is the east fringe of agro-pasture transitional zone in northern China and highly sensitive to global change. Time series of SPOT-VEGETATION Normalized Difference Vegetation Index (NDVI) data are used to detect the vegetation cover change during last 9 years. Results show that the yearly maximum value composite mean NDVI over the study area increased slightly from 0.277 in 1998 to 0.287 in 2006, which indicated the increasing trend of vegetation activity. The annual average NDVI value in whole area was steady. Very slight improved and slight improved area reached 113442.32 km^2 and 27987.34 km^2, taking up 67.81% and 16.73% of the whole study area respectively. The degraded regions occupied about 15.16%. During 1998-2006, the landscape evolution in the western Liaohe River Basin was characterized by two opposite processes, namely vegetation restoration (returning cropland for farming to grassland and close grazing) and desertification (especially land salinization). The increasing amplitude is larger than the decreasing amplitude on the whole. There was obvious decrease of monthly MNDVI in spring months, while increasing tendency of monthly MNDVI in summer and autumn was found. Results will help to provide valuable information for environmental management policies involving biodiversity preservation and rational exploitation of natural and agricultural resources in this vulnerable ecotone.

Keywords: interannual vegetation change, NDVI, SPOT/VEGETATION, the western Liaohe River Basin

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No. 014

Construction and Visualization of Complicated Objects for 3D GIS

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ABSTRACT

Three dimensional (3D) construction and visualization has become an integral part in many GIS and their applications. This paper examines how 3D visualization systems can be used with and integrated into GIS. We analyze several key characteristics visualization techniques should satisfy in order to be used efficiently by GIS, and show how GIS can provide visualization and animation features for geo objects by embedding the visualization system. The approach for the construction and visualization of complicated mining engineering environment implemented in the system is described in detail. Aspects like presentations of multidimensional data with spatial dependence, navigation in the geographical frame of reference and in time, interaction techniques are presented. Real data derived from an iron mine of China demonstrates the effectiveness and efficiency of the system.

Keywords: visualization, 3D GIS, digital mine, volume rendering, marching cubes algorithm

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No. 016

Analysis on slope uncertainty based on different resolution level DEM —A Case Study

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ABSTRACT

Digital Elevation Model (DEM) is indispensable for much analysis such as topographic feature extraction, runoff analysis, slope stability analysis, landscape analysis and so on. Such analysis requires a high accurate DEM. The accuracy of DEM is usually represented by spatial resolution and height accuracy. Slope is one of the crucial terrain variables in spatial analysis and land use planning, especially in the mountain region which is suffering from serious soil erosion. However slope accuracy derived from DEM usually does not match with its popularity. A quantitative simulation to slope uncertainty is important not only theoretically but also necessarily to applications. The objective of this study was to analyze the slope uncertainty of Yizi following GIS based on different DEM resolution. Comparative and math-simulation methodology was employed for data processing and analysis. There is a linear correlativity between mean slope, slope change rate and different DEM resolution within the study area, and the analysis and simulation result shows that different DEM resolution has great influence on slope uncertainty. This methodology applied in this study should be helpful to similar researches in spatial data uncertainty investigation.

Keywords: GIS, DEM, slope uncertainty, simulation, information extraction

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No. 017

The landscape patterns change of Tarim Populus Nature Reserve and its eco-environmental effects, Xinjiang, China

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ABSTRACT

Landscape change and its eco-environmental effects have becoming one of the hottest issues of research on global environmental changes. In this paper, Tarim Populus Nature Reserve, located in the middle stream of Tarim River and eco-environment is fragile with relatively strong human activities, high evaporation and low rainfall, was selected as the target area, and applied remote sensing technology and geographic information systems (GIS) to obtain the basic data for landscape patterns change of the study area in 1973、1992 and 2001. Based on 3S technology and monitored data from field investigation, the characteristics of landscape patterns change, the drivers and its effects on the eco-environment of Tarim Populus Nature Reserve in recent 30 years were analyzed. According to the landscape transition matrix, the degree of land use change in the two different periods (1973-1992, 1992-2001) was analyzed, and a scientific basis for the eco-environment protection of Tarim Populus Nature Reserve was provided.

Keywords: Effects, landscape patterns change, Tarim Populus Nature Reserve

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No. 018-1

Study on Classification method of TM Image with Artificial Neural Network

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ABSTRACT

Given the shortage of classified methods for remote sensing informations at present, the Self-organizing Artificial Neural Network is applied to classifying for TM image in order to improve classification accuracy in this paper. At the same time, as for the effecting factors of classification remote sensing image, Surface structure is considered as important parameter, which is different from other classified methods only considering spectral characters(including ENVI, Tasseled Cap, principle components, TM seven bands and etcs). Taking example for the research area of Guangzhou city, comparing with the traditional maximum likelihood classification, the result shows that the Self-organizing Artificial Neural Network is better than the supervised Maximum likelihood classification and the new method is more efficient, It is very important to provide one new mean for the classification of surface object characters in remote sensing image.

Keywords: TM image classification, surface structure, Self-organizing Artificial Neural Network, Maximum likelihood

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No. 018-2

The study on Atmospheric Correction of TM Image Data in GuangZhou

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ABSTRACT

To extract accurately quantitative information from remote sensing image, Atmospheric Correction is a necessary step. The quantitative analysis of Atmospheric Correction is still one among the important issues in application of remote sensing images. Based on the characteristics of the MODTRAN (transfer model) and the dark-object method, they are combined to remove atmospheric effects of remote sensing image in this study. In order to improve the speed of Atmospheric Correction by MODTRAN model, the dark-object method is used to acquire Path Radiance, which is one of main parameters in MOTRAN model. The new method is applied to TM image in the working area of GuangZhou. The result of the above study shows that the atmospheric correction model combining MODTRAN with the dark-object method appears to be a very hopeful approach. Compared with the MODTRAN model, the new model advances surface-atmospheric coupled efficiency. But contrasted with the dark-object method, the precision of atmospheric correction is advanced.

Key Words: Atmospheric Correction, TM, MODTRAN model, Dark-object method

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No. 019

Design and implementation on rapid web publication of massive remote sensing images

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ABSTRACT

With the progress of researches on the integration of Geographic Information System (GIS) and Remote Sensing (RS), digital earth, and information sharing, to publish RS images on the Internet has become a significant research work. In this study, image pyramid model was introduced, and an efficient algorithm to build image pyramid was presented for convenient data storage and retrieval. In order to improve the efficiency, the process of image cutting and resampling was implemented in the RAM, avoiding the unnecessary I/O operations. The algorithm was implemented by combining Java and C++ languages, ensuring both the processing speed and distributed architecture. And two distributed implementation approaches were proposed, based on B/S and C/S architecture respectively. In the programs, some useful functions, such as data compression, image format conversion, watermarking, and automatic error-correction, were also implemented to facilitate and ensure the web publishing work. Tests of the programs with a global RS image showed that they worked efficiently, robustly, and flexibly under the Internet environment. Also, the programs were endowed with user-friendly graphical interfaces, and easy to use. Therefore the rapid web publication of RS images on the Internet becomes easier to accomplish.

Keywords: WebGIS, remote sensing, remote sensing image, image pyramid model, web publication

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No. 020

Surface Water Hydrologic Simulation of Qingshuijiang Watershed Based on SRTM DEM

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ABSTRACT

The Digital Elevation Model (DEM) derived from NASA's Shuttle Radar Topography Mission is the most accurate near-global elevation model that is publicly available. The characteristics, advantages, and disadvantages of Shuttle Radar Topography Mission (SRTM) data sets were reviewed and discussed briefly. In order to verify the effect of applying SRTM data sets in surface water hydrologic simulation, a tool set named Arc Hydro Tools that is utilized to extract watershed characteristics was introduced, developed as an ArcGIS interface. The Qingshuijiang watershed in Guizhou Province, Southwest China, was taken as a case study. Using the tool set, the river network and subwatersheds of main tributaries were delineated from CGIAR- CSI SRTM 90 m DEM. By comparing the river network delineated from CGIAR-CSI SRTM 90 m DEM with the actual river network and comparing areas of the subwatersheds delineated from CGIAR-CSI SRTM 90 m DEM with the actual areas of the subwatersheds, it can be concluded that the delineated river network is generally in accord with the actual river network, as well as the areas of the delineated subwatersheds. The CGIAR-CSI SRTM 90 m DEM will promote the use of geospatial science and applications for digital topography analysis, especially for surface water hydrologic simulation.

Keywords: SRTM DEM, Arc Hydro Tools, automated extraction, river, watershed

No. 021

Variation of chlorophyll a concentration before an algal bloom in Taihu Lake detected by MODIS/Terra imagery

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ABSTRACT

The occurrence of algal bloom has threatened the water quality of Taihu Lake that provides drinking water for millions of people in the eastern Chinese city of Wuxi, Jiangsu Province. Chlorophyll a presented in living phytoplankton is a very important ecological and environmental parameter of waters and it is usually used as indicator of the algal bloom. To assess changes in chlorophyll a concentration distributions before an algal bloom in Taihu Lake on May 29,2007, a linear model was established between the radio of band 1 (620-670nm) to band 2 (841-876nm) of the MODIS medium-resolution bands and the *in situ* measurements of chlorophyll a concentration. The distributions of chlorophyll a concentration are mapped. The phytoplankton patches are evenly distributed over the Taihu Lake during March 2007, while the patches are confined to north part of the lake along the bank during May 2007, including Meiliang Bay where the water supply of Wuxi city is. This study demonstrates that the moderately high resolution of MODIS/Terra 250-m data is useful for monitoring the chlorophyll a distribution in small inland water body such as Taihu Lake.

Keywords: MODIS; Taihu Lake; chlorophyll

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No. 022

The Research and Realization of Embedded GIS Cross Platform Technique

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ABSTRACT

For the reason of embedded processors and embedded operating systems, and under the rapid motivation of application demands, cross platform technique has become a key point and developing direction in embedded GIS field, with the main purpose that once the application software has been written, it can run on multiple platforms with little modification or without modification. At present, cross platform technique includes three major aspects: middleware technique, Java Virtual Machine technique and abstract layer technique. Among these three techniques, the realization process of middleware has a close contact with the host operating system platform. Java Language has a good cross platform property relying on Java virtual machine, but code execution efficiency is poor. Abstract layer technique also has a good cross platform property, high code execution efficiency and better expansibility, but the interface definition and relative realization of abstract layer are more complicated. A fine software system architecture structure is important to ensure success for any software system. Obeying the hierarchical and modular design principle of cross platform software methods, after analyzing and comparing the advantages and disadvantages of the three cross platform techniques in details, abstract layer technique is adopted in this paper to design the software system architecture of embedded GIS cross platform, and describes the interior components of software developing platform layer. At present this cross platform architecture has been successfully realized on WinCE and Vxworks platforms, and the performance of operating map is very good.

Keywords: Cross Platform, Embedded GIS, Middleware Technique, Java Virtual Machine, Operating System Abstract Layer, Hierarchical architecture, Component technique

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No. 023

Strategic planning: building an enterprise geographical information systems of Ras al Khaimah- United Arab Emirates

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ABSTRACT

This research was done to determine the feasibility of creating a fully functional Geographical Information Systems (GIS) in Ras al Khaimah (RAK) and its implementation strategy and process constrains. The purpose of strategic planning is to create a framework within which the complexity and interdependency of GIS design and implementation can be managed. RAK GIS Project (RAKGIS) is intended not only to serve all departments of the local government, but will embrace the needs of a variety of external agencies, other levels of government, and the private sector. The Emirate has identified and plan to utilized GIS technology as a means for improving its business processes, infrastructure, services, information and decision-making. The processes used in this research project can be divided into three distinct phases: strategy formulation, current situation assessment, and the tactical planning.

Keywords: Strategic Planning, GIS, Enterprise, Ras al Khaimah, UAE.

No. 024

Estimation of net primary productivity in North Tibet Plateau by integrating CASA model with MODIS data

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ABSTRACT

This paper reports on the development and testing of a procedure for assessing large-scale patterns of vegetation Net Primary Productivity (NPP) in North Tibet Plateau. This work was based on Carnegie-Ames-Stanford Approach (CASA) model, multi-temporal MODIS data and ground meteorological data. The research shows that: (1) for NPP, an estimated result of North Tibet Plateau approaches an actually tested value. A fast diagnosis and an accurate evaluation to temporal and spatial distribution of NPP can be fulfilled by CASA model; (2) spatial distribution of NPP appears a progressive decrease from SE to NW and this distribution is identical to hydrothermal conditions and vegetations zonal differentiation. A total NPP in study area is 46.434MtC/a, the largest occurring in high-cold meadow, making up 48.4 percent; the second in high-cold steppe, 39.24 percent, respectively; (3) NPP is featured by an obvious seasonal variation: extremely low in middle winter (from November to March), its cumulative value making up 3.2 percent of annual NPP; highest in summer (from June to September), its cumulative value covering 84 percent, respectively. This temporal variation of NPP is related to the seasonal variation of both temperature and moisture content in North Tibet Plateau.

Keywords: Net Primary Productivity, CASA, MODIS, North Tibet Plateau

No. 025

Coupling multi-agent model and GIS to simulate pine wood nematode disease spread in ZheJiang province, China

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ABSTRACT

A coupled method based on multi-agent model, remote sensing and GIS is described to simulate the forest disease spread. The coupled model focuses on the temporal dynamics of the *Bursaphelenchus xylophilus* population at the landscape scale. Each individual is modeled as an autonomous agent who behaves according to a set of rules including spreading in the landscape, feeding on *Pinus massoniana*, sheltering in forest edges and dying, constrained by terrain, land cover and other variables. The model parameters are derived from remote sensing data and field measurements. Ten factors, including damage degree of *Pinus Massoniana*, altitude and slope, are helped to build the transfer rules. The main outputs are the dynamic disease distribution maps and survived pine population. Our method is applied and validated in DingHai distinct, Zhou Shan city of Zhejiang Province. Three Landsat TM images from the year 1991 to 2006 are used for the pine information extraction. The extracted pine distribution map is used to compare with the simulated surviving pine map. The results show that the coupled model can produce reasonable results and be used as a virtual experiment tool. However, it is difficult to simulate the human activities to help or prevent disease spread and the long fly behavior of insect vectors. Therefore, there still exists some difference between the simulated results and the real data. At the next step, those factors will be considered.

Keywords: Multi-agent model, forest disease spread, Bursaphelenchus xylophilus

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No. 026

The application of Oil-Gas engineering techniques based on the digital earth platform

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ABSTRACT

This paper explains the Oil-Gas engineering technologies supported by Digital Earth Platform[1], which combine today's process of exploring, developing, and transporting etc., these key technologies with spatial information technology supported by Digital Earth Platform, resulting in the improvement of the scientificity, accuracy, and rationality of the petroleum engineering technologies and the reduction of the cost and the increase of the benefits.

Keywords: Digital earth platform; Oil-Gas development; Oil-Gas exploration; Oil-gas transportation

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No. 027

Application-oriented Model-base System

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ABSTRACT

Models are often thought as the abstraction of object, phenomenon, system and process. But the present model base system is good at the abstraction of process which starts from the input data to the results. And it falls short of the model composition. Based on the object-oriented methods, this paper aims to discuss a new application-oriented model base system. The structure of model interface parameter is abstracted into descriptive model (DM) which can be regarded a bridge between different models. Using object-oriented method, a series researches has been made focused on DM, and establish the application-oriented model-base system. The model working flow and user-oriented model inheritance mechanism were designed for applying and maintaining the model resource easily. A prototype system was designed and developed, and an application demonstration is shown to verify its feasibility.

Keywords: Model, Model base, Object-oriented, Application-oriented, Model-base System, DSS

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No. 028

Spatial Structure and Distribution of Heavy Metals in Agricultural Soils of Peri-Urban Area in Pudong of Shanghai, China

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ABSTRACT

The contents of heavy metals (Cu, Zn, Pb, Cd, Cr, Hg and As) in agricultural surface soils of Peri-Urban Area in Pudong of Shanghai were analyzed to investigate the heavy metal contents and spatial distribution. Different evaluation methods and assessment standards were also used for comparison. In addition, Kriging method based on GIS was also applied to study the spatial variability of heavy metal pollution. The result showed that mean concentrations of heavy metals were all higher than the natural-background values of them, respectively, except for Pb and As. Based on the national soil quality standard, Cu, Zn, Cd and Hg were determined in some regions, with the ratios of 3.8%, 2.1%, 9.2% and 0.8%, respectively. However, the contents of Pb, Cr and As were much lower than the values of national soil quality standard. The analysis of spatial distribution showed that the soil quality was influenced by different heavy metals at different levels. Cu, Zn, Cd and Hg were the dominant elements, causing soil heavy metal pollution in the area. Additionally, the regional differentiation of soil pollution was also obvious.

Keywords: agricultural soil, heavy metals, peri-urban area, variogram, spatial distribution

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No. 030

Study on agricultural application of remote sensing technology in water and soil loss district of China's Loess Plateau----Taking Shanxi Province as an example

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ABSTRACT

The article reports on the research work about applying remote sensing technology to conduct agricultural natural resources investigation and dynamic monitoring, and soil conservation information system management, and introduces major achievements at various stages. After 35 years of research in Shanxi Province agricultural natural resource investigation and dynamic monitoring have gone through the initial experimental stages of macro, micro and the combination of fixed location with its property and quantity, and have now developed into mature quantization research stages of fusion system of combing remote sensing, Geographical Information System and Geographical Information Science, so as to provide practical research technology for agricultural natural and environment management and decision making. With rapid development of science and technology, deepening of the remote sensing research, we will gradually set up Numeric Agriculture in Shanxi Province and decision making and information management system of resources and environment monitoring, improvement and exploration on county, prefecture and provincial scales, so as to put Shanxi agricultural natural resources and environment management on the scientific way. It has a great significance in a long term.

Keywords: Natural Resource, Environmental Protection, Remote Sensing Monitoring

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No. 032

Design and performance analyze of the police geographic information system with B/S architecture

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ABSTRACT

The Web based Geographic Information Systems (GIS) are applied widely, and most of them are facing the challenge of performance deterioration when have large capacity data and the demand of interactive application within web page. In this paper, a system named Foshan city Police GIS (PGIS) has been constructed based on ArcServer (published by ESRI company) to satisfy the demand of performance and expansibility of the large scale Web GIS, and some main aspects which affect Web GIS's performance have been tested, including layer's amount, raster data's compress, pyramidal storage plan, database optimization, disk array, and cache plan. With the analysis of the tests, we can form strategies to satisfy different environments and demands.

Keywords: GIS, Web GIS, raster data, vector data, web service, performance

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No. 033

An Intelligent Computational Algorithm Based on Neural network for Spatial Data Mining in Adaptability Evaluation

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ABSTRACT

Back-propagation neural network model (BPNN) is an intelligent computational model based on stylebook learning. This model is different from traditional adaptability symbolic logic reasoning method based on knowledge and rules. At the same time, BPNN model has shortcoming such as: slowly convergence speed and partial minimum. During the process of adaptability evaluation, the factors were diverse, complicated and uncertain, so an effectual model should adopt the technique of data mining method and fuzzy logical technology. In this paper, the author ameliorated the back-propagation of BPNN and applied fuzzy logical theory for dynamic inference of fuzzy rules. Authors also given detail description on training and experiment process of the novel model.

Keywords: Intelligent compute, back propagation, spatial data mining, adaptability evaluation

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No. 034

Investigation on methods of land cover classification of TM image in mountain area——a case study of the Mentougou district, China

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ABSTRACT

The main purpose of this study was to develop a methodology for classification of Landsat satellite imagery for mountain area cover type mapping. Single-stage classification and multi-stage iterative classification were selected to determine which the classification of satellite imagery could be employed to obtain accurate land cover information in in Mentougou district located in western Beijing with diverse topography. TM data used in the study consisted of one quarter-scenes acquired on 19 June, 2001. The use of ancillary information in the process of deriving thematic maps from satellite imagery was analyzed. Original information used for the production of the vegetation map of Mentougou was used as the source for ground information on the land cover in the study area. Other ancillary data layers such as topography was used in the analysis. Five classifications methods are used for TM data in the paper: 1) single-stage classification, 2) single-stage classification with DEM analysis, 3) single-stage classification with PCA analysis, 4)iterative classification with band selection, and 5) unsupervised classification. The accuracy of each classification is expressed as an error matrix from which the Kappa statistic and its large sample variance are derived. Results on study of typical mountain area indicate that the classification result of four kinds of supervised classification was significantly better than that of unsupervised classification and the multi-stage iterative classification approach was significantly better than the single-stage classification approach. And this organizational methodology for classification is feasible and reliable in mountain area image classification.

Keywords: Mentougou district; Land cover; multi-stage classification; TM Image

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No. 035

Spatial and Temporal Dynamic of Urban Sprawl in West China: A Case Study of Chongqing, China

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ABSTRACT

Based on eight remotely sensed images, this paper studies the spatial-temporal characteristic of Chongqing's city spatial morphology evolution in recent three decades. The process and characteristics of urban expansion and urban morphology are analyzed using fractal dimension, radiation index and compactness index based spatial morhoplogic measurement coupled with land use change mornitoring. The results show that Chongqing developed by leaps and bounds and experienced three major stages, i.e., relatively stable period in the 1980s, the slow development period after the mid-1980s and the relatively high-speed development period in recent years. The urban built-up area was 87.32km^2 in 1978 and increased to 282.91km^2 in 2005. The increase built-up area originagtes from different land use type, of which about 76.86% coverted from arable land and about 20.52% coverted from rural area and dependent factory, diggings land and other construction area.

Keywords: build-up area, spatial morphology, compactness index, shape index, fractal, chongqing, urban sprawl

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No. 036

Study on spatial structure of retailing based on GIS in Wuhan city

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ABSTRACT

With the agility of market economy, the characteristic of market spatial structure becomes more complex since the reformation and open policy. The spatial structure has broken through the traditional framework which is non-equilibriums and scattered, and represented such modern development character as diversification, grade, network, and non-equilibrium. This paper chooses 200 stochastic retailing stores whose acreages all exceed 40m^2 in the four circles of Wuhan city, after the analysis of spatial difference on acreages, number, population density, and manage forms with GIS spatial methods, and makes a conclusion that the retailing spatial structure of Wuhan city has took on figure of rating circle wholly and frame of centralization-diffusion and enchasing partially; as location is concerned, centralization and diffusion takes place simultaneously, has behaved that retailing concentrated in heartland of city with more favorable traffic and market location by the means of market infiltration, and distributed in suburb more dispersive by market monopoly.

Keywords: retailing; ring-shape structure; centralization-diffusion structure; enchasing structure; suburbanization; Wuhan city

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No. 037

Parallel Implementation of Aerosol Optical Depth Retrieval from MODIS

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ABSTRACT

Aerosol optical depth (hearafter called AOD) is an important geophysical parameter, and its retrieval from satellite data are both data and computationally intensive. For the tremendous advantage of parallel computation over serial computation in computation time, it has been gaining more and more popularity in computationally intensive applications such as climate modeling, remote sensing applications and digital signal processing in scientific fields. This paper presents the implementation of parallel AOD retrieval from the Moderate Resolution Imaging Spectroradiometer (MODIS) satellite data, based on IBM System Cluster 1600 deployed in Chinese Meteorological Administration (CMA), with focuses on the design of parallel algorithm through Single Program Multiple Data (SPMD) model. In order to demonstrate the parallel performance of the proposed parallel implementation, experiment of parallel AOD retrieval is given, and results show that the implementation of AOD parallel computing, as a viable cost-effective method, has great scalability on clusters machines, which can obtain optimum performance at 128 processors. Meanwhile, the parallel algorithm can be operationally used in AOD retrieval in the near future, which is an important input parameter for the air quality model.

Keywords: AOD; Parallel Computation; Domain decomposition; SPMD

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No. 039

Semi-automatic extraction of ribbon roads from high resolution remotely sensed imagery by T-shaped template matching

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ABSTRACT

In this paper, we present a novel approach for semi-automatic extraction of ribbon road axes from high resolution remotely sensed imagery. The core of our system is a road tracker based on T-shaped template matching. T-shaped template is composed of a profile perpendicular to the road axis and a rectangle parallel to and as wide as the road marks or strips of vegetation. Actually, the T-shaped template matching is an integration and improvement of typical profile matching and rectangular template matching. At the same time, parabola is deployed to model the road trajectory to predict the position of subsequent road points and to guide the tracking go through bad road conditions. Simultaneously, the least square matching is employed to search the precise road centerline point. Extensive experiments demonstrate that our proposed algorithm can fast and reliably trace roads with road marks or strip of vegetation.

Keywords: road extraction, road tracking, profile matching, template matching, semi-automatic

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No. 040

Simplification and rectangularity of building-polygon based on least squares adjustment theory in map generalization

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ABSTRACT

This paper presents a method of building feature generalization through boundary division and line approximation according to Least Squares Adjustment theory. How to detect a point set and divide the segments is investigated in detail in the paper. Based on the Least Squares Adjustment theory with constraint conditions, the paper offers a model of rectangularity of building-polygon on condition that the sum of the squares of displacement distances of all points is minimum. These solutions have been realized in a software GenTool, which is an interactive map generalization software in real applications.

Keywords: map generalization, least squares adjustment theory, simplification, rectangularity.

No. 041

Using Anomaly Detection Method and Multi-temporal Radarsat Images for Short-term Land use/Land Cover Change Detection

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ABSTRACT

Rapid urbanization took place in the Pearl River Delta of south China since 1980. Although drastic land use change took place in very short interval within this area, hardly any research has been done on this phenomenon for lacking of available data. Remote sensing is presently the most favorable observation method for land use and land cover change (LUCC) researches. While located in the south of China, the Pearl River Delta suffers from heavy cloud cover for more than half of the year. This makes real-time LUCC monitoring and change detection almost impossible with commonly used optical remote sensing data. In this paper, the orbital highest resolution SAR (Synthetic Aperture Radar) data - Fine Mode Radarsat data was used for trail of short-term land use change detection. Three scenes of repeat-pass Radarsat data was collected over the study area. Although repeat-pass Radarsat enable continuous land use monitoring under all weather condition, images acquired during different time are inevitably affected by seasonal land cover change and variable environmental status such as air humidity and raining. Besides, some significant observation bias might be induced because of the platform and sensor instability. All these variations and instability made short-term land use change detection quite a perplex problem. In this paper, short-term land use change caused by human activity was considered as abnormal phenomena in both spatial and temporal domain in time series images. And a Density-based Anomaly Detection (DBAD) algorithm was designed to detect abnormally changed land parcels in time series Radarsat images. Firstly, totally 3 scenes of fine mode Radarsat images were collected in the study area from January 1st to May 3rd, 2006. Simply stacked temporal images reveal apparent backscattering variation between the three scenes of images, which

mainly owes to the fast vegetable growth during the observation period. Then image segmentation was done on the multi-temporal Radarsat images and object features including mean value of backscattering coefficient (Mean), minimal value of backscattering (Min), homogeneity of gray level co-occurrence matrix (GLCMhomo) and dissimilarity of gray level co-occurrence matrix (GLCMdis) were extracted basing on segmented image objects. After that change-vector was constructed for each land objects. In the third step DBAD algorithm was applied to the change vector dataset to detect anomaly change in the 3 scenes of images. Finally field surveying data plus manual interpretation were used for validation. Comparing with object-based image regression method, DBAD results in better accuracy. Besides, data validation also shows that DBAD have better accuracy in both under-constructed area and newly built up area (error lower than 12%). While for built up area and some mixed used area, it gains relatively lower accuracy than other land types (from 10% to 28.57%). To conclude, short-term land use change in time series images could be defined as spatial and temporal anomaly in remote sensing images. By extending traditional anomaly detection to spatial-temporal anomaly detection, land use change caused by human activity could be effectively detected during short time intervals. The algorithm DBAD focus only on the density of change vectors in feature space, which is independent of the amplitude and direction of change vectors. This enable DBAD effectively discriminate temporal image variation caused by observation system, environment or seasonal land cover change, especially in vegetation and cultivated area which changed remarkably during the observation period, from land use change caused by human activities. This helps to decrease the false alarming in short-term change detection.

Keywords: Times series, short-term change detection, Radarsat, SAR image, anomaly detection, land use land cover

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No. 042

Study on Parallel and Distributed Management of RS Data Based on Spatial Data Base

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ABSTRACT

With the rapid development of current earth-observing technology, RS image data storage, management and information publication become a bottle-neck for its appliance and popularization. There are two prominent problems in RS image data storage and management system. First, background server hardly handle the heavy process of great capacity of RS data which stored at different nodes in a distributing environment. A tough burden has put on the background server. Second, there is no unique, standard and rational organization of Multi-sensor RS data for its storage and management. And lots of information is lost or not included at storage.Faced at the above two problems, the paper has put forward a framework for RS image data parallel and distributed management and storage system. This system aims at RS data information system based on parallel background server and a distributed data management system. Aiming at the above two goals, this paper has studied the following key techniques and elicited some revelatory conclusions.The paper has put forward a solid index of "Pyramid, Block, Layer, Epoch" according to the properties of RS image data. With the solid index mechanism, a rational organization for different resolution, different area, different band and different period of Multi-sensor RS image data is completed. In data storage, RS data is not divided into binary large objects to be stored at current relational database system, while it is reconstructed through the above solid index mechanism. A logical image database for the RS image data file is constructed. In system architecture, this paper has set up a framework based on a parallel server of several common computers. Under the framework, the background process is divided into two parts, the common WEB process and parallel process.

Keywords: Multi-sensor RS image data, Parallel process, Distributed management, Storage organization.

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No. 044

SHG-Tree: An Efficient Granularity-based Spatial Index Structure

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ABSTRACT

To improve the access efficiency of multidimensional spatial database, this study proposes a new index structure named Space Hypercube Grid Tree (SHG-Tree). By avoiding the problems of node split and recombination, SHG-Tree can efficiently support the common operations over spatial database containing objects with dynamic region. The main contributions of this paper include: (1) Proposes SHG-Tree of *n*-dimensional space with a hierarchical tree structure. It reflects the region overlapping relationship of hypercube grid units with different granularity. (2) Proposes the linearization methods to present the bounding rectangle of object as a union of variant granularity hypercube grids. (3) Gives operations of SHG-Tree. Experiments result shows the size of SHG-Tree is small enough to remain in main memory even to very large spatial database by applying proper linearization strategy and the queries on SHG-Tree are less than ten milliseconds to ensure the real-time of query.

Keywords: Spatial index, Multidimensional spatial object, Space Hypercube Grid Tree

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No. 046

Thematic information extraction and background parameters analysis in remote sensing classification

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ABSTRACT

This paper mainly explains two methods about how to improve the accuracy of remote sensing classification. The first method is composite hierarchical classification with multiple information sources, assisted by GIS and based on statistical interpretation. The other one is analysis on background parameters. The experiment shows that they not only improve the methods of the conventional remote sensing classification, but also raise its accuracy.

Keywords: thematic information, background parameters, remote sensing classification

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No. 048

Zoigê Wetland Eco-environment Impact Research Basing on RS and GIS Techniques

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ABSTRACT

Employing RS and GIS techniques, an assessment project on dynamic monitoring Zoigê marsh wetland indicates that the wetlands are encountering the degradation and the desertification, calculating the wetland changes accurately, and predicting the potential eco-environment impacts.

Keywords: wetlands, RS and GIS, desertification, eco-environment

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No. 049

Feature matching algorithm based on spatial similarity

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ABSTRACT

The disparities of features that represent the same real world entities from disparate sources usually occur, thus the identification or matching of features is crutial to the map conflation. Motivated by the idea of identifying the same entities through integrating known information by eyes, the feature matching algorithm based on spatial similarity is proposed in this paper. Total similarity is obtained by integrating positional similarity, shape similarity and size similarity with a weighted average algorithm, then the matching entities is achieved according to the maximum total similarity. The matching of areal features is analyzed in detail. Regarding the areal feature as a whole, the proposed algorithm identifies the same areal features by their shape-center points in order to calculate their positional similarity, and shape similarity is given by the function of describing the shape, which ensures its precision not be affected by interferes and avoids the loss of shape information, furthermore the size of areal features is measured by their covered areas. Test results show the stability and reliability of the proposed algorithm, and its precision and recall are higher than other matching algorithm.

Keywords: map conflation, the same entities, matching, spatial similarity

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No. 050

Estimation of soil moisture conditions with Landsat TM in Guangzhou

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ABSTRACT

As useful indicators for land surface characteristics, Land Surface Temperature (LST) and Normal Different Vegetation Index (NDVI) can provide information on vegetation and moisture conditions at the surface. In this study, Qin's mono-window algorithm and Temperature-Vegetation Dryness Index (TVDI) were employed to study LST and soil moisture conditions in Guangzhou. Landsat TM image dated on November 23, 2005 was used to retrieve the LST and TVDI. A geospatial model was designed and processed for getting LST and soil moisture status. The result images reveal that, the areas with high land surface temperatures mainly appeared in the centers of urban. On 23 November, 2005, areas with high land surface temperatures took up 26.15%, while urban heat island areas with higher land surface temperatures took up 11.6% in Guangzhou. Except water and urban or built-up land, humid and normal areas took up 22.05%, slight drought areas took up 60.75%, drought areas took up 17.01%, and heavy drought areas took up 0.16%.Compare to the real status of soil moisture, the result indicate that the TVDI index can provide a powerful tool to assess the soil moisture conditions for large scale areas in Guangzhou.

Keywords: Land Surface Temperature, Soil moisture, Landsat TM, NDVI

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No. 051

Hedonic Valuation of the Spatial Competition for Urban Circumstance Utilities: Case Wuhan, China

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ABSTRACT

It has generally accepted Alonso's [1] theory about the allocation of different land uses of commerce, resident and industry in urban area. A bunch of researches have provided their aspects of the theme of the relationships between urban circumstances and urban land uses in either the influence of one or several designate circumstance factors on different land uses, or the comprehensive analysis of the influence of all kinds of circumstance on one selected land usage (e.g. residential use). There is still not a wholly analysis about the influence of all kinds of spatial characteristics, available for the location selection of different land uses. That's why this research selects to engage in a study on the difference among "consumer preferences" to the location amenities in the city. Here we regard the behavior as "spatial competition of the locations". Hedonic regression model (HRM) analysis is employed as the basic framework of the research. Tabular comparison of HRM parameters performed with principal components analysis (PCA) and Geographic Information Science (GIS) provides all necessary numerical investigation and spatial analysis until to the finally results. The research can be helpful for putting forward to a further integrated investigation on the relationship between urban circumstance and real land use values.

Keywords: hedonic regression method, urban land value, circumstance utility, locational characteristics, principal components analysis, GIS

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No. 054

Application of MODIS on monitoring dissolved inorganic nitrogen and dissolved inorganic phosphorus in Haizhou Gulf

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ABSTRACT

Red tides have been increasingly observed in the gulf of Haizhou and considered a serious environmental problem from the beginning of the new century. Eutrophication of water is an important reason of red tide occurrence. This paper used the observation data of the concentration of dissolved inorganic nitrogen (DIN) and dissolved inorganic phosphorus (DIP) in Haizhou Gulf from 2004 to 2006 and selected synchronous MODIS Terra 1B data with 500m spatial resolution in this period of time. We established factors with single band and multi-bands, and then calculated the correlation of each factor with DIN concentration, DIP concentration, and their logarithm respectively. The factors with stronger correlation were used to establish regression models of DIN and DIP's concentration. After comparing these models, we chose the linear model of DIN concentration established by factor $F_{11(3,4)}$ and inverse model of the logarithm of DIP concentration established by factor $F_{7(6,5)}$ as their final regression model. The relative accuracy of DIN concentration model achieved about 70%; the retrieving results of DIN concentration were consistent well with real conditions. The relative accuracy of the logarithm of DIP concentration achieved about 90%. The results prove the feasibility of monitoring DIN concentration and the exponential order of DIP concentration in offshore of Jiangsu Province.

Keywords: Dissolved inorganic nitrogen (DIN), dissolved inorganic phosphorus (DIP), MODIS, Haizhou Gulf

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No. 056

Research on Presentation and Query Service of Geo-Spatial Data Based on Ontology

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ABSTRACT

The paper analyzed the deficiency on presentation and query of geo-spatial data existed in current GIS, discussed the advantages that ontology possessed in formalization of geo-spatial data and the presentation of semantic granularity, taken land-use classification system as an example to construct domain ontology, and described it by OWL; realized the grade level and category presentation of land-use data benefited from the thoughts of vertical and horizontal navigation; and then discussed query mode of geo-spatial data based on ontology, including data query based on types and grade levels, instances and spatial relation, and synthetic query based on types and instances; these methods enriched query mode of current GIS, and is a useful attempt; point out that the key point of the presentation and query of spatial data based on ontology is to construct domain ontology that can correctly reflect geo-concept and its spatial relation and realize its fine formalization description.

Keywords: GIS; land-use ontology; semantic granularity; spatial query; geo-concept

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No. 057

Modeling the Spatial Resource Allocation Based on Justice Principle

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ABSTRACT

The spatial distribution of resources and services needs to be planned and allocated thoroughly in order to satisfy the demands of social justice. The spatial accessibility indices are well-known for their significant roles in the fields of planning and allocation for resources. In this paper, we present a Spatial Resource Allocation Model based on Justice Principle. In the model, a group of linear equations of the supplies' resources are deduced according to the gravity-based accessibility index. The model consists of two submodels: one is for supply, and another is for demand. The submodel for supply ensures that every supply has the same gravity-based accessibility index, which is equal to the total demands- total supplies ratio in the value of 1. At the same time, the just allocation submodel for demand ensures that every demand has the same gravity-based accessibility index, which is equal to the total supplies- total demands ratio in the value of 1. The Matlab-based commands are utilized to implement the model and an application example is given to demonstrate the utility and effectiveness of it.

Keywords: spatial resource just allocation; gravity-based accessibility index; spatial analysis; GIS

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No. 058

Based on 3G and RFID Logistic Delivery Management System Application and Practice Analysis

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ABSTRACT

This article in view of the Logistic Delivery Management characteristic, analysis the logistic delivery management cannot satisfy requests rapid reaction and conformity transportation at present and so on. This article elaborated based on 3G (GIS, GPS, and GPRS) and RFID technology logistic delivery contents and so on management system, system design and architecture design, and its effective integration. The system design mentality uses the systems engineering method, follows the humanist idea, and embarks from user's demand, according to the user demand and the network request, divides according to the laminated structure into the decision-making strata, the service level, the management maintenance level and the technical support level 4 levels. The overall structural design including the system function structural design and the software system design, and take some province logistic delivery management system in management service as an example, introduced the design mentality and the application way.

Key words: GIS; GPS; GPRS; RFID

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No. 059

Research and exploration on Digital Township

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ABSTRACT

The word "Digital Township" comes from "Digital Earth", "Digital China", "Digital City" and "Digital Agriculture". According to theory and technology of "Digital Earth", regarding the research all over the world, "Digital Township" means describing the whole village or town with digital information technology. That is built on the basis of computers, networks, multimedia, mass memory store and other technologies. It describes the village or town by abundant information of multi-resolution, multi-scale and multi-dimension with 3S technology, so that it can provide service for scientific management, decision making and sustainable development of the village or town. In this paper, the main configuration of "Digital Township" is discussed. Then, the construction idea of "Digital Township" and the problems we may meet are put forward. At last, a case of Xiangyin town of Shandong province is illustrated. Xiangyin made beneficial attempt to build its "Digital Township" system. This work is a very good demonstration and induction of digital Township construction. However, there is a long way for all constructors of Digital Township.

Keywords: Digital Earth; Digital City; Digital Township; GIS; informatisation

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No. 060

A Hierarchical Visualization Model of the Global Terrain Based on QTM

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ABSTRACT

A global multi-resolution digital elevation model (DEM) and a feasible solution for its visualization and management remains a challenging vision. In this paper a multi-resolution DEM based on the ellipsoidal triangular meshes is made to approximate to the earth surface. It was built through quaternary triangular mesh (QTM) hierarchical tessellation of the ellipsoidal surface. In order to achieve fast access, we organize the global DEM data as a hierarchy of Diamonds and indexing them based on the linear quadtree. Furthermore, a LOD is built through recursive subdivision of each Diamond, and an approach of viewpoints-based data extraction based on the neighbor-Diamond searching from the global DEM data is implemented for visualization. All this is backed with an implementation of a prototype computer system.

Keywords: Quaternary Triangular Mesh (QTM);Digital elevation model (DEM); Ellipsoidal triangular meshes; Hierarchical tessellation; Linear quadtree

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No. 061

Scalable 3D GIS Environment Managed by 3D-XML Based Modeling

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ABSTRACT

Nowadays, the namely 3D GIS technologies become a key factor in establishing and maintaining large-scale 3D geo-information services. However, with the rapidly increasing size and complexity of the 3D models being acquired, a pressing needed for suitable data management solutions has become apparent. This paper outlines that storage and exchange of geospatial data between databases and different front ends like 3D models, GIS or internet browsers require a standardized format which is capable to represent instances of 3D GIS models, to minimize loss of information during data transfer and to reduce interface development efforts. After a review of previous methods for spatial 3D data management, a universal lightweight XML-based format for quick and easy sharing of 3D GIS data is presented. 3D data management based on XML is a solution meeting the requirements as stated, which can provide an efficient means for opening a new standard way to create an arbitrary data structure and share it over the Internet. To manage reality-based 3D models, this paper uses 3DXML produced by Dassault Systemes. 3DXML uses opening XML schemas to communicate product geometry, structure and graphical display properties. It can be read, written and enriched by standard tools; and allows users to add extensions based on their own specific requirements. The paper concludes with the presentation of projects from application areas which will benefit from the functionality presented above.

Keywords: Scalable 3D data, 3DXML, XML-based lightweight format

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No. 063

High Quality Prime Farmland Extraction Pattern Based on Object-oriented Image Analysis

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ABSTRACT

High Quality Prime Farmland (HQPF) is high, stable yields based on land consolidation of prime farmland, and has its important impact upon China's food security. To make clear the status-in-quo of the HQPF is important to its construction and management. However, it is difficult to get the spatial distribution information of the constructed HQPF enough rapidly in mountainous area using ground investigation, as well as hard to satisfy the requirements of large-scale promotion. A HQPF extraction framework based on object-oriented image analysis is discussed and applied to aerial imageries of Tonglu County. The approach can be divided into 3 steps: image segmentation, feature analysis & feature selection and extraction rules generation. In the image segmentation procedure, canny operator is used in edge detection, an edge growth algorithm is used to link discontinuous edge, and region labelling is carried out to generate image object. In the feature analysis & selection procedure, object-oriented feature analysis and feature selection methods are also discussed to construct a feature subset with fine divisibility for HQPF extraction. In the extraction rules generation procedure, the C4.5 algorithm is used to establish and trim the decision tree, then HQPF decision rules are generated from the decision tree. Compared with supervised classification (MLC classifier, ERDAS 8.7) and another object-oriented image analysis method (FNEA, e-Cognition4.0), the accuracy assessment shows that the extraction results by the object-oriented extraction patters have a high level of category consistency, size consistency and shape consistency.

Keywords: High Quality Prime Farmland, Object-oriented Image Analysis, Image Segmentation, Tonglu County

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No. 064

Swarm intelligence and spatial information process

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ABSTRACT

Following the development of spatial data collection technologies, more and more spatial data have been collected through various ways. Increasing demands are being put forward on use of spatial data in many aspects such as spatial data analysis, spatial data mining and knowledge discovery. Swarm intelligence is one of the most known examples in different manners, which offers an alternative way for spatial information process. This paper intends to focus on this new approach in spatial information process by using swarm intelligence. We first study the mechanism of this issue from a new point view, then the advantages of this advanced technology in spatial information process is discussed, and the research status in the field of spatial information process is studied. Last we presented applied Nature Inspired System for the future intelligent spatial information process.

Keywords: Swarm intelligence, nature inspired system, spatial information process

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No. 065-1

Assessment on Urban Ecological Security Spatial Differences Based DPSRM Framework-the case of Dalian

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ABSTRACT

The urban ecological system is a fragile and an unstable ecosystem. Compared with the natural ecological system, the urban ecological system has many disadvantages, such as high consumption of energy and material, environmental pollution problems and low amount of natural resources. The rapid urbanization process has resulted in innumerable ecological environmental problems, and things are even getting worse. The eco-environmental security in the cities of spatial differences is being outlined. This thesis analyzes the pros and cons of some causal chain structure model, such as PSR, DSR and DPSIR, and raises a new ecological security assessment model--causal network model of DPSRM model, combined with GIS spatial analysis method, researching the health status of ecosystem in Dalian City. The conclusions are: First, it proposes the network model by way of studying the disadvantages of chain models during the past, according to the complexity of urban ecosystem. It also makes assessment indicators system of the "Driving force-Pressure-State-Response-Control" model and applies fuzzy Analytic Hierarchy Process (AHP) and indicates weights by a comprehensive and compared method for results. Secondly, it does a field survey and collects the detailed data about the urban ecological security system and digitizes the correlative information of urban ecological security. Finally, it shows the states of ecological health and spatial differences of urban ecological security by spatial analysis of GIS.

Keywords: DPSRM framework; urban ecological security; assessment indicators system; spatial differences; dynamic grid system; Geographic Information System(GIS)

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No. 066

An improved cellular automata forecasting model for urban land use spatial structure changes

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ABSTRACT

Though the urban land use spatial dynamic simulation and forecasting based on cellular automata (CA) model have achieved remarkable progress, the CA model still has some problems and drawbacks in forecasting urban land use changes. In view of the deficiencies of traditional urban CA, an improved CA model based on spatial dynamic data mining and random forecast is proposed in this paper, which establishes an operable CA method to forecast and simulate the discrete status attribute. This improved CA model is examined in analyzing the urban land use structure changes in Jinan 2002-2006 and testified both feasible and effective. Based on the remote sensing images in Jinan 2002 and 2006, the urban land use spatial structures are classified into five types, commercial land, residential land, education facility, industrial land and the other. With the improved CA model, the urban land use framework in Jinan in 2010 was calculated, the result of which can be used as a reliable reference information for the following urban land use planning.

Keywords: cellular automata (CA), transition rule, urban land use, random forecast, dynamic forecast

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No. 067

Comparison analysis of agricultural land gradation evaluation based on different weight making methods

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ABSTRACT

Agricultural land gradation links land classification and land appraisal. It indicates the difference in agricultural productivity resulted from differences in land's natural characteristics and/or the effectiveness and efficiency of agricultural production at present and in the future. Technically, agricultural land is graded based on the sum of weighted indices and further classified by equal-distance, or axis, or sum frequency curve. It is critical to define the system of weights in this process. In practice, a single or mixed weight system has been widely applied in agricultural land gradation. However, few studies put efforts in comparing outcomes in applying different systems of weights for a specific area. This research applied several popular systems of weights, such as AHP, factor analysis, grey relation analysis, entropy method, and etc., in gradating agricultural land in Jintan, Jiangsu province. Outcomes resulted from different systems of weights were compared. The result did illustrate the obvious differences among these outcomes, which in turn stood for differences among systems of weights. Considering biases inherent in different systems of weights, a system of combined weights is highly recommended for the general practice in agricultural land gradation.

Key words: Agricultural land, gradation classification, weight making

No. 068

Inversion and Validation of QingHai Lake Temperature

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ABSTRACT

Making the best of the similarity and difference of Terra and Aqua satellites, the table for searching radiant temperature is established. The radiant temperature of Terra and Aqua are imitated. It's a fact that observing angle, solar zenith angle and water column of atmosphere affect radiant temperature and the transmission, and the affection is also analysed in the paper. Under the precondition that the similarity is found, the feasibility of retrieval of land surface temperature based on Terra/Aqua is researched. In addition, the field data of Qinghai Lake are selected to validate the retrieval algorithm and retrieve Land Surface Temperature.

Keywords: Terra, Aqua, MODIS, Surface temperature, Surface emissivity, Qinghai Lake, Remote Sensing, atmospheric vapor, atmosphere temperature, ratio radiate rate

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No. 069

Plumbum contamination detecting model for agricultural soil using hyperspectral data

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ABSTRACT

The issue of environmental pollution due to toxic heavy metals in agricultural land has caused worldwide growing concern in recent years. Being one of toxic heavy metals, the accumulation of Plumbum (Pb) may have negative effects on natural and agricultural vegetation growth, yield and quality. It can also constitute short-term and long-term health risks by entering the food chain. In this study, we analyze the relationships between physical and chemical characteristics, biological parameters of soil-vegetation system and hyperspectral spectrum responses systematically. The relation between hyperspectral data and the biological parameters of Pb polluted wheat canopy such as leaf pigments, leaf moisture, cell structure and leaf area index (LAI) are discussed. We detect the changes in the wheat biological parameters and spectral response associated with Pb concentration in soil. To reveal the impact mechanisms of Pb concentration on agricultural soil, six models including chlorophyll-leaf moisture model, chlorophyll-cell structure model, chlorophyll-LAI model, leaf moisture-cell structure model, leaf moisture-LAI model, cell structure- LAI model are explored. We find that changes in Pb concentration present various features in different models. Pb contamination in agricultural soil can be identified and assessed effectively while integrating the characteristics of those developed models.

Keywords: Plumbum contamination model, crop, hyperspectral remote sensing, multiple discriminant analysis

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No. 070

High resolution surface sediment type mapping using hyperspectral image and field data in muddy intertidal flat area

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ABSTRACT

Mapping surface sediment types is particularly challenging in muddy intertidal flat area due to muddy characteristics and tidal fluctuation. With the combination of Hyperion hyperspectral image and field survey data, two regression based image interpretation methods, namely characteristic band method (CBM) and band differential method (BDM), were used for sediment type classification and mapping. It was found that under low tidal level there was a strong correlation between surface sediment reflectance and its sand, silt and clay contents in shortwave infrared band. For 2102nm wavelength, the correlation coefficient by former method reached -0.8954, 0.9070 and 0.6547 respectively while the latter method had a relatively lower correlation capability. So choosing this band as the characteristic band, three linear regression models were constructed and the sand, silt and clay contents were quantitatively inversed from their corresponding reflectance values. A linear equilibrium corrective method was then applied to some "bad" pixels for inversed contents amendment due to regression model's linear transforming limitation. Based on these corrected component contents, Shepard triangular classification method was adopted and the sediment types for the whole intertidal flat were automatically obtained with a high interpretation precision of 87.9%. Results showed that the hyperspectral remote sensing reversion method could be well utilized for dynamic monitoring and analyzing of the depositional environment changes in muddy intertidal flat region.

Keywords: Intertidal flat, hyperspectral, sediment, component content, linear equilibrium correction, Shepard triangle

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No. 071

Detection of clusters and outlying nodes in spatial networks

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ABSTRACT

Construction of network clusters and identifying hub nodes from networks has attracted more and more attentions in spatial network analysis. In this paper, we proposed clustering algorithm and outlying node detection algorithm for spatial road network analysis. Network clustering algorithm consists of constructing clusters and creating a simplified structure of the network. When performing clustering on the network, we introduced the definitions of strong cluster and weak cluster, where each node has more connections within the cluster than with the rest of the graph, for achieving reliable and reasonable clusters. For users' understanding the structure of the network, we constructed a simplified graph approximation of the network, whose nodes were representative nodes in clusters of the network, and edges were the connections between those representative nodes. In outlying node detection algorithm, a node is identified as an outlier, not because of its distribution different from that of other nodes but for its unexpected statistical information. Whether a node is an outlier or not is examined with centrality index. The larger the node has centrality indexes, the more probabilistically it may be identified as an outlier. The experimental results on artificial data sets demonstrated that two algorithms are very efficient and effective.

Keywords: Spatial network, network Clustering, Outlying node detection

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No. 072

Tikhonov-based ARCE algorithm and its applications in rapid positioning using single frequency GPS receivers

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ABSTRACT

ARCE (Ambiguity Resolution Using Constraint Equation) is a new fast method to resolve the integer ambiguities based on LSE (Least-Squares Estimate) and null space, which is suitable for single frequency GPS receivers and whose necessary observation time span of fixing the integer ambiguities correctly is relatively long (say, at least one minute). In this paper, ARCE is improved for deformation monitoring when there is only one epoch phase observation. In this instance, the normal matrix is rank-deficient and it is impossible to fix the integer ambiguities correctly using ARCE if LSE is employed. In allusion to the above case, based on Tikhonov regularization theorem, a new regularizer is designed to transform the rank-deficient normal matrix to a full rank one. The accurate float ambiguity solutions are obtained and the corresponding search range of the integer ambiguities diminishes. So, the integer ambiguities can be fixed using ARCE. The effect of the single epoch algorithm is tested utilizing a baseline whose length over 3KM and the results show that the success rate of fixing the integer ambiguities using the new algorithm can achieve to over 90 percent.

Keywords: ARCE, Tikhonov regularization, ambiguities, GPS rapid positioning

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No. 074

The evaluation of land consolidation's benefits based on extensional matter-element model

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ABSTRACT

The purpose of this study is to describe a new method to evaluate land consolidation's benefits. Integrated benefits evaluation of land consolidation includes the followings: ecological service benefits, social security benefits and economic development benefits, which are the basis of land consolidation benefit's evaluation. First of all, this paper built the evaluation index system consisting of target hierarchy, rule hierarchy and evaluating indexes hierarchy. And then, through calculating integrated correlation degree that influences the benefits, the multi-ingredient of land consolidation's benefits evaluation was transformed into the single-object decision. According to matter-element model, extension theory and correlation function, extensional matter-element model was introduced to calculate land consolidation's benefits. The results indicate that this model can find the interrelationships among the evaluating factors and then calculate the real value of comprehensive benefits, which makes the post-implementation evaluation more valid and effective and reflects the level of land consolidation's benefits.

Keywords: Land Consolidation, matter-element model, integrated benefits evaluation, correlation function

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No. 075

Development of the updated system of city underground pipelines based on Visual Studio

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ABSTRACT

Our city has owned the integrated pipeline network management system with ArcGIS Engine 9.1 as the bottom development platform and with Oracle9i as basic database for storaging data. In this system, ArcGIS SDE9.1 is applied as the spatial data engine, and the system was a synthetic management software developed with Visual Studio visualization procedures development tools. As the pipeline update function of the system has the phenomenon of slower update and even sometimes the data lost, to ensure the underground pipeline data can real-time be updated conveniently and frequently, and the actuality and integrity of the underground pipeline data, we have increased a new update module in the system developed and researched by ourselves .The module has the powerful data update function, and can realize the function of inputting and outputting and rapid update volume of data. The new developed module adopts Visual Studio visualization procedures development tools, and uses access as the basic database to storage data. We can edit the graphics in AutoCAD software, and realize the database update using link between the graphics and the system. Practice shows that the update module has good compatibility with the original system, reliable and high update efficient of the database.

Keywords: city underground pipeline network, pipeline system; update, Oracle9i database, visual studio

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No. 076

Exploitative Intensity Evaluating of Zhuhai Coastal Zone Land Resource by Multidimensional -Vectors Model

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ABSTRACT

Coastal zone, as the interactive area between ocean and land, is a very complex and fragile system. Coastal zone supports diverse and productive coastal ecosystems and provides significant ecological, cultural, and economic benefits to human beings. However, with the rapid growth in both population and economy, coastal ecosystems are being subjected to ever increasing pressure. Coastal zone that was formerly wisely used is being destroyed in the pursuit of economic wealth which has greatly threaded human's sustainable development. Beside excessive resource exploitation and environmental pollution, unreasonable land use is also another important fact which could cause great damages to the coastal ecosystems. The purpose of this paper is to evaluate the degree of land exploitation and utilization in Zhuhai coastal zone which locates at the west of Pearl River Estuary. A new model named Multidimensional-Vectors Model which is suitable to coastal zone was established. Land-use data of Zhuhai coastal zone in 1995, 2000, and 2005 was used. The exploitative intensity of land-use between 1995 to 2000, and 2000 to 2005 was calculated by this model. Main characteristics of exploitative intensity of land in Zhuhai coastal zone can be generalized as follows: Areas with high exploitative intensity is mainly concentrated alone the coastal line except some small area scattered in the region far away from the sea. Area with high exploitative intensity from 1995 to 2000 is larger than that from 2000 to 2005, and the spatial distribution of high exploitative intensity during 1995 to 2000 period is more concentrative than that form 2000 to 2005.

Keywords: coastal zone; Zhuhai; land use; exploitative intensity; model

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No. 077

Accuracy analysis on C/A code and P(Y) code pseudorange of GPS dual frequency receiver and application in point positioning

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ABSTRACT

When the Anti-Spoofing (A-S) is active, the civilian users have some difficulties in using the P(Y) code for precise navigation and positioning. Z-tracking technique is one of the effective methods to acquire the P(Y) code. In this paper, the accuracy of pseudoranges from C/A code and P(Y) code for dual frequency GPS receiver is discussed. The principle of measuring the encrypted P(Y) code is described firstly, then a large data set from IGS tracking stations is utilized for analysis and verification with the help of a precise point positioning software developed by authors. Especially, P(Y) code pseudoranges of civilian GPS receivers allow eliminating/reducing the effect of ionospheric delay and improve the precision of positioning. The point positioning experiments for this are made in the end.

Keywords: C/A code, P(Y) code, Z-tracking, point positioning

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No. 078

Research on Modeling the Overpasses for Mapping and Navigation

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ABSTRACT

With the rapid development of current mapping and navigation industry, and transportation network data becoming multi-model and multi-dimensional, research on modeling the overpasses for mapping and navigation becomes a tough issue. Though there are various road network models, their traditional road network structures do not solve the problem well. After analyzing the benefit and deficiency of existent strategies of expanding on the traditional node-arc model and raster based method to solve the planar network problem, this paper proposes a data model with three level structures. If the scope of road network is larger, such as district or country, its network topology can be expressed in LOD1, based on centerline, and its organization is similar to before-mentioned arc-node method. But for the navigation management or traffic flow analysis, the three-level network topology need to be expressed in LOD2, based on carriageway, and add attributes to some special nodes, such as the overpasses intersection. If the network is for high-level, real-world traffic management, its topology need to be expressed in LOD3, based on lane. Lastly, a method of integrating GDF with the proposed model is given.

Keywords: Overpasses, data models, centerline, carriageway, lane, GDF

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No. 079

GIS-Based Visual Simulation of the Underground Transformer Substation Construction

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ABSTRACT

By use of 3D dynamic visual simulation technology based on GIS, this paper puts forward a suit of construction system of 3D visual digital modal and construction process simulation methods for pit foundation. Graphical modeling and dynamic simulation of the entire construction process visualization was realized. At first, the 3D geologic strata model is realized according to pre-results of our research group, the 3D visual digital model construction method and corresponding standard database establishment are discussed, and then according to the relational database, the whole up-down construction method of pit foundation construction process dynamic simulation path is set up. The graphical modeling facilitates the establishment of simulation model by combining graphic model elements based on hierarchical modular modeling theory. The entire process uses discrete event system simulation basic concept, adjusts to use relational database, and carries out construction model combination. Combining the whole and detail simulation states, the paper carries out the entire dynamic construction progress simulation, and at last develops a large 3D visual simulation system of pit foundation based on the World Expo 500kV transformer substation pit foundation of Shanghai World Exhibition.

Keywords: DUSE, Pit foundation, GIS, 3D visual simulation

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No. 080

Urban drain layout optimization using PBIL algorithm

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ABSTRACT

Strengthen the environmental protection is one of the basic national policies in China. The optimization of urban drain layout plays an important role to the protection of water ecosystem and urban environment. The paper puts forward a method to properly locate urban drain using population based incremental learning (PBIL) algorithm. The main factors such as regional containing sewage capacity, sewage disposal capacity quantity limit of drains within specific area are considered as constraint conditions. Analytic hierarchy process is used to obtain weight of each factor, and spatial analysis of environmental influencing factors is carried on Based on GIS. Penalty function method is put forward to model the problem and object function is to guarantee economy benefit. The algorithm is applied to the drain layout engineering of Nansha District, Guangzhou City, China. The drain layout obtained though PBIL algorithm excels traditional method and it can protect the urban environment more efficiently and ensure the healthy development of water ecosystem more successfully. The result has also proved that PBIL algorithm is a good method in solving this question because of its robust performance and stability which supplied strong technologic support to the sustainable development of environment.

Keywords: drain layout, water ecosystem, urban environment, GIS

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No. 081

Research of E-government GIS

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ABSTRACT

Human beings is entering the Information Age, and E-government has become the main direction of the administrating innovation for many countries. It is the E-government information's character of geographical space and positional relevancy that makes E-government GIS that utilize spatial data and related technologies play important role in government administration. The paper comprehensively studied on application the running mechanism, the model of frame and the guarantee of data in E-government GIS.

Keywords: E-government, E-government GIS, geographical and spatial data

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No. 082

A Schema-matching-based Approach to Propagating Updates between Heterogeneous Spatial Databases

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ABSTRACT

Simply speaking, updates propagation is to use updates from one newly-updated database (called Master Database, MDB) to revise, improve and correct the content of the other database (Called Client Database, CDB) for ensuring that CDB also has a current representation of the terrain. Currently, updates propagation between spatial databases is usually a complex and time-taking process because of the multi-level potential heterogeneities between them and the special requirement of keeping the updated CDB autonomous, complete, correct, and consistent as much as before. To simplify and improve the propagation of updates, a detailed classification of the possible heterogeneities between MDB and CDB is introduced and their influences on updates propagation are also analyzed. Based on these analyses, an appraoch based on schema matching is proposed to effectively implement updates propagation. The automated solutions to operations involved in this approach are discussed in detail, such as schema matching, entity identification, updates extraction, and updates integration.

Keywords: spatial database, schema matching, updates extraction, entity identification, updates integration

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No. 083

Mining moving objects trajectories in Location-based services for spatio-temporal database update

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ABSTRACT

Advances in wireless transmission and mobile technology applied to LBS (Location-based Services) flood us with amounts of moving objects data. Vast amounts of gathered data from position sensors of mobile phones, PDAs, or vehicles hide interesting and valuable knowledge and describe the behavior of moving objects. The correlation between temporal moving patterns of moving objects and geo-feature spatio-temporal attribute was ignored, and the value of spatio-temporal trajectory data was not fully exploited too. Urban expanding or frequent town plan change bring about a large amount of outdated or imprecise data in spatial database of LBS, and they cannot be updated timely and efficiently by manual processing. In this paper we introduce a data mining approach to movement pattern extraction of moving objects, build a model to describe the relationship between movement patterns of LBS mobile objects and their environment, and put up with a spatio-temporal database update strategy in LBS database based on trajectories spatio-temporal mining. Experimental evaluation reveals excellent performance of the proposed model and strategy. Our original contribution include formulation of model of interaction between trajectory and its environment, design of spatio-temporal database update strategy based on moving objects data mining, and the experimental application of spatio-temporal database update by mining moving objects trajectories.

Keywords: LBS (Location-based Services), spatio-temporal data mining, mining moving trajectory objects, spatio-temporal database, update strategy

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No. 084

Design and Construction of Spatial Decision Support System Database based on Metadata

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ABSTRACT

The Spatial Decision Support System (SDSS), as an emerging field of science and technology, is combined by Geographic Information System (GIS) and decision support system (DSS). Nowadays, more and more attentions have been paid to the technology of SDSS, and the construction of geographic database in SDSS has been a hot-spot for many years. One of the commonly used methods in geographical data management is directly entry spatial and attributes information into the relational database (generally used the Oracle relational database). Metadata plays an important role in process of building and in spatial data management. A case study is introduced. The Beijing Rural Resource Management Geographical Information System (BJRMGIS) is designed for the Beijing Agricultural Research Center, aiming for rural spatial decision support to facilitate its analysis operations. The paper mainly contains two parts from the viewpoint of database, that is, the design of database metadata table and the function of database maintenance. (1) The frame of metadata. According to report of needs analysis, the data in BJRMGIS are classified into four categories: fundamental data, remotely sensed image data, statistical data and multimedia data. Moreover, the map is a special form of data. (2) The database maintenance functions include three modules, that is, user management, database import and database management. This paper put forward the metadata-based database management decision support system model, and process from the practical problems to solve the applications. Also, the construction provides a reference for designing of other similar SDSS systems.

Keywords: Metadata; Spatial Database; SuperMap; Oracle 9i; Geographic Information System

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No. 085

A Grid Framework for Integration Multi-scale Vector and Imagery Data

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ABSTRACT

With ever-growing archives of multi-source raster images and maps, many spatial applications such as multi-scale database updating, progressive web mapping and 3D terrain visualization call for rapidly automatic integration of GIS and imagery data. The object-oriented methodology display novel characteristics for multi-scale representation. While, management for multi-scale datasets is still lag behind, especially for multi-source data form different spatial reference system (DSRS). In this paper, we review problems with state of the art integration of multisource data. A hierarchical grid framework has been introduced, spatial information multi-grids (SIMG). Three fundamental components to do multi-scale and multi-source datasets analysis are required for SIMG. First, it is necessary to fastly unify different spatial reference system (DSRS) data. Secondly, efficient spatial grid and scale encoding must be applied to support flexible management of multi-scale datasets. Moreover, strategy delineated image data simplification from detailed to broad scale must to be developed. The approaches including the optimal scale identification, object-oriented upscaling and spatial grid and scale encoding for image-objects have been presented. And the experimental was implemented by applying the framework to integrate vector map of SRS in Beijing54 with Landsat TM image of SRS in WGS84, to detect city region sprawl in Zhengzhou located by the Yellow river, China. It is suggested by results that real-time DSRS integration need fewer time cost than traditional method. The image classification accuracy at optimal scale reached 90.4 percent of kappa, and upscaling results of multi-scale datasets here were more outstanding than multilevel wavelets method. So, this study was easily operated with great effectiveness.

Keywords: SIMG, DSRS, multi-scale, upscaling, scale encoding.

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No. 086

Standardization of CAD on Measurement and Recording of Historic Buildings

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ABSTRACT

The Chinese traditional architecture belongs to an experience type construction system with strict standardization. In wooden structure design and construction, the modulization and standardization is required, which just corresponds to the requirement of standardization and precision of CAD in nowadays. Therefore, CAD can be applied to measure and record historic architecture. In the 2D imaging, the single members such as *dou* (bracket set) *gong* (bracket arm), beams, columns and other basic units can be recorded accurately through CAD to build up a relative database system as well as to provide basic data platform for studying the whole wooden frameworks. Meantime, such data can be used again while redesign. Furthermore, area models could be also applied to the urban conservation arrangement of ancient imperial palace, imperial city and capital city. The 3D mathematical model shows the scene of single building, groups of building and their details directly. According to the various types of buildings, with the different precisions, parameterized model base is established for further research and application.

Keywords: Chinese architecture, wooden structure, modular system, computer aided design

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No. 087

Locating Urban Cemeteries a Study Using Geo-Information in Guilin, China

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ABSTRACT

Indiscriminate placing of cemetery sites has aroused many conflicts between burial land and other kinds of land use. A comprehensive review of burial practice is carried out in order to determine the elements involved in cemetery planning, which concerns both practical and immaterial issues. A conceptual model is established, using a GIS-based spatial multiple criteria decision analysis (SMCDA) to locate urban cemeteries, and the north part of urban Guilin city has been chosen as the case study area. Besides conventional multiple criteria analysis, a particular dimension of "sustainable suitability" for cemetery location is analyzed via spatial-temporal analysis among three scenarios of different time—at present and in the future—based on the land use master plan in order to ensure sustainable development of urbanization. Research shows special as burial land is, the planning procedure should be comprehensive as those of other lands and demonstrates how effective the GIS-based SMCDA is when locating suitable urban cemeteries. The attention paid to cemetery planning is valuable concerning the development of land for the dead as well as for the living.

Keywords: urban cemetery, GIS (Geographic Information System), DSS (decision support system), SMCDA (spatial multiple criteria decision analysis)

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No. 089

A Comparison of Several Raw Data Compression Algorithms for Acquisition of Remotely Sensed Data

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ABSTRACT

As an active microwave sensor, synthetic aperture radar (SAR) is capable of continuously monitoring geophysical parameters related to the structural and electrical properties of the earth's surface and subsurface. With the development of advanced SAR technologies with high resolutions and multiple imaging modes, SAR generates a large amount of remotely sensed data to be transmitted and processed. The raw data compression has become important tools to reduce the huge amount of data for downlink and required memory on-board. In this paper, four compression algorithms are discussed, including block adaptive quantization (BAQ) algorithm, amplitude and phase compression (AP) algorithm, wavelet BAQ (WT-BAQ) algorithm and wavelet packet BAQ (WPT-BAQ) algorithm. Considering the statistical independent property between amplitude and phase of raw data along with the growing popularity of wavelets, two additional algorithms are presented: wavelet AP (WT-AP) algorithm and wavelet packet AP (WPT-AP) algorithm. The six different algorithms are compared in the signal domain and the image domain with several quality parameters and the simulation is given to validate analytic result. The experimental results will be used for remotely sensed data acquisition, data processing and SAR systems design.

Keywords: synthetic aperture radar (SAR), raw data compression, block adaptive quantization (BAQ), amplitude and phase compression (AP), wavelet transform (WT), wavelet packet transform (WPT)

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No. 090

The Study on LUCC and Its Human Drive Factors in Quanzhou City

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ABSTRACT

Based on the 1988 and 2000 remote sensing data and the "3S" technology, we not only attempt to analyze the dynamic change form the structure of quantity and spatial change of Land Use in Quanzhou City, but also use the representatively correlation method to explain the interrelation between this change of Land Use and the social economic factors, by the CANCORR program of SPSS. Furthermore, according to the viewpoint of Humanism, we try to find out the function of the social power factors, the social culture factors which conclude natural view, axiology, dietetically custom, habitation fashion and consumed tropism .etc and the developing industries of local color on the Land Use change. From this research, the result show: 1) the structure of quantity of Land Use change remarkably from county to county, the most reducing quantity of paddy field, dry land and garden plot are separately the county of DeHua, HuiAn and NanAn. And the most driver factor is the developing industries of local color; 2) the type change of Land Use caused by the production value of extractive industry, light industry and the third industry, basic contracture investment, output of tea and fruit, convenient extent of road and income of per farmer and so on in Quanzhou City between 1988 and 2000. In a word, the dynamic change of Land Use impact by more factors we have mentioned, and it's extend is more and more multistage, especially in Quanzhou City. As we study, the dynamic change of Land Use is enslaved to human factors in Quanzhou City.

Keywords: LUCC; Human Factors; Quanzhou

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No. 091

Effect of land use change on storm runoff simulation using a simple distributed hydrological model

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ABSTRACT

Land-use change is the most remarkable symbol of the earth landscape evolution, also one of the main factors which accelerate regional and even global change. The impact of land-use change on storm runoff is a hot topic in hydrologic research and is often assessed by hydrological model through designed land-use scenarios. In this study, a simple distributed hydrological model is introduced and improved to make model scheme more close to the practical processes and integrate with more remote sensing data. The improved model is tested with six representative and isolated storm events and gained a good performance. All the relative errors of storm runoff depth are less than 18% and the peak discharge errors are within 20%. Although the flood peak of all storm take place one or two hours in advance, but the Nash efficiency are approving, not less than 81%. The investigation of land-use change effect through 4 designed land-use scenarios reveal that land cover with forest corresponds to large interception and woody savanna corresponds to small interception. The croplands have almost the same interception as in actual land-use. Runoff depth decreases in forest land and increases in woody savannas and croplands. Peak discharges have the same variation as runoff depth. Croplands make peak discharge increase more than 20%, at the same time, return period of flood become shorten. However, the time to flood peak are changeless in every land-use scenarios due to the small study area probably.

Keywords: Land-use change; Storm runoff; Distributed hydrological model; LAI; Land-use scenarios

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No. 092

A New Index Structure for Global Geospatial Data

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ABSTRACT

In recent years, the way to manage massive geospatial information of a global scale by Discrete Global Grid Systems (DGGSs) has attracted great attention. In this paper, a new geospatial data index structure is proposed. Firstly, planar multi-resolution hexagon grids are projected to spheres by Snyder Equal-area Polyhedral Projection to construct grid systems. Then, the spatial relationships between spherical hexagon grids are converted into spherical triangle quad-tree by quaternary groups of boundary vertexes. Additionally, extended Quarternary Triangular Mesh (QTM) encoding scheme is utilized in three-axis discrete grid coordinate systems to facilitate the transformation between geographic coordinates and cell address codes. Finally, cell analyzing and searching algorithm are proposed. Experimental results show that the index structure proposed in this paper can operate cell address codes directly and efficiently.

Keywords: Geospatial information, hexagon, grid system, index, searching

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No. 093

Quantitative analysis of scale sensitivity in geographic cellular automata

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ABSTRACT

Geographical Cellular Automata (GCA) approach is based on complexity theory and is widely used in geospatial modeling. A reason for the increasing attention given to GCA models is that they can easily be integrated with raster-based GIS environment. However, the behavior of the GCA models is affected by uncertainties arising from the interaction between model elements, structures, and the quality of data sources used as model input. The objective of this study is to examine the impacts of model elements on the generated outputs of a GIS-based GCA land-use growth model using sensitivity analysis (SA) approach. The proposed SA method consists of KAPPA index with different spatial metrics. A stochastic GCA model was built to model land use change in the changsha region (Hunan,China). The transition rules were empirically derived from four Landsat-TM (30m resolution) images taken in 1996,1999, 2002 and 2005 that have been resampled to four resolutions (30, 60, 90, 120m). Five different neighbourhood configurations were considered (Moore, Von Neumann, and circular approximations of 2, 3 and 4 cell radii). Simulations were performed for each of the twenty spatial scale scenarios. Results show that spatial scale has a considerable impact on simulation dynamics in terms of both land use area and spatial structure. The spatial scale domains present in the results reveal the nonlinear relationships that link the spatial scale components to the simulation results.

Keywords: Geographical Cellular Automata, Scale, Geographical Information System (GIS), Land-use change

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No. 094

Research on Texture Feature of RS Image Based on Cloud Model

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ABSTRACT

This paper presents a new method applied to texture feature representation in RS image based on cloud model. Aiming at the fuzziness and randomness of RS image, we introduce the cloud theory into RS image processing in a creative way. The digital characteristics of clouds well integrate the fuzziness and randomness of linguistic terms in a unified way and map the quantitative and qualitative concepts. We adopt texture multi-dimensions cloud to accomplish vagueness and randomness handling of texture feature in RS image. The method has two steps: 1) Correlativity analyzing of texture statistical parameters in Grey Level Co-occurrence Matrix (GLCM) and parameters fuzzification. GLCM can be used to representing the texture feature in many aspects perfectly. According to the expressive force of texture statistical parameters and by Correlativity analyzing of texture statistical parameters, we can abstract a few texture statistical parameters that can best represent the texture feature. By the fuzziness algorithm, the texture statistical parameters can be mapped to fuzzy cloud space. 2) Texture multi-dimensions cloud model constructing. Based on the abstracted texture statistical parameters and fuzziness cloud space, texture multi-dimensions cloud model can be constructed in micro-windows of image. According to the membership of texture statistical parameters, we can achieve the samples of cloud-drop. By backward cloud generator, the digital characteristics of texture multi-dimensions cloud model can be achieved and the Mathematical Expected Hyper Surface(MEHS) of multi-dimensions cloud of micro-windows can be constructed. At last, the weighted sum of the 3 digital characteristics of micro-window cloud model was proposed and used in texture representing in RS image. The method we develop is demonstrated by applying it to texture representing in many RS images, various performance studies testify that the method is both efficient and effective. It enriches the cloud theory, and proposes a new idea for image texture representing and analyzing, especially RS image.

Keywords: Texture feature, Cloud model, RS Image, Texture multi-dimensions cloud

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No. 095

Research on Edge Detection Algorithm of RS image

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ABSTRACT

A fuzzy edge detection algorithm based on object-cloud and maximum fuzzy entropy principle are proposed in this paper. According to the uncertainty of the objects in the RS image, the spatial objects in RS image space can be mapped to the cloud space by 1:M cloud model. Object-cloud will have the digital characteristics to describe the fuzziness and randomicity of objects in RS image. According to the cloud operation, boundary-cloud and its digital characteristics can be achieved and the membership matrix of transition region can be constructed. By maximum fuzzy entropy principle, edge detection can be accomplished in the membership matrix of transition region.

Keywords: Edge detection; Object-cloud; RS image; Mapping; Entropy

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No. 096

Land-Use/Land-Cover Change Detection Using Change-Vector Analysis in Posterior Probability Space

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ABSTRACT

Land use/land cover change is an important field in global environmental change research. Remote sensing is a valuable data source from which land use/land cover change information can be extracted efficiently. A number of techniques for accomplishing change detection using satellite imagery have been formulated, applied, and evaluated, which can be generally grouped into two types. (1) Those based on spectral classification of the input data such as post-classification comparison and direct two-date classification; and (2) those based on radiometric change between different acquisition dates. The shortage of type 1 is cumulative error in image classification of an individual date. However, radiometric change approaches has a strict requirement for reliable image radiometry. In light of the above mentioned drawbacks of those two types of change detection methods, this paper presents a new method named change vector analysis in posterior probability space (CVAPS). Change-vector analysis (CVA) is one of the most successful radiometric change-based approaches. CVAPS approach incorporates post-classification comparison method and CVA approach, which is expected to inherit the advantages of two traditional methods and avoid their defects at the same time. CVAPS includes the following four steps. (1) Images in different periods are classified by certain classifier which can provide posterior probability output. Then, the posterior probability can be treated as a vector, the dimension of which is equal to the number of classes. (2) A procedure similar with CVA is employed. Compared with traditional CVA, new method analyzes the change vector in posterior probability space instead of spectral feature space. (3) A semiautomatic method, named Double-Window Flexible Pace Search (DFPS), is employed to determine the threshold of change magnitude. (4) Change category is discriminated by cosines of the change vectors. CVAPS approach was applied and validated by a case study of land use change detection in urban area of Shenzhen, China using multi-temporal TM data. Kappa coefficients of "change/no-change" detection and "from-to" types of change detection were employed for accuracy assessment. The experimental results show that CVAPS outperform than post-classification comparison method and can avoid cumulative error effectively. Besides, radiometric correction is not needed in this method compared with traditional CVA. Therefore, it is indicated that CVAPS is potentially useful in land-use/land-cover change detection.

Keywords: change vector analysis; Posterior probability space; land use/cover change

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No. 097

Improved conceptual three-band model for Chlorophyll-a retrieval in Inland Case-Ⅱ waters

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ABSTRACT

In terms of the importance and challenge of accurate Chlorophyll-a (Chla) estimation in inland Case-Ⅱ waters, many empirical or semi-empirical algorithms are established to extract information on Chla concentrations from remote sensing reflectance R_{rs} . However, the assumption that the optical parameter of Chla specific absorption coefficient $a^*_{ph}(\lambda)$ remains constant usually restrains their estimating accuracy, including the conceptual three-band model $[R_{rs}^{-1}(\lambda_1) - R_{rs}^{-1}(\lambda_2)] \times R_{rs}(\lambda_3)$ developed originally for estimating Chla amounts in terrestrial vegetation recently. Therefore, in this paper, an improved conceptual three-band model with the correction of Chla specific absorption coefficient $[R_{rs}^{-1}(\lambda_1) - R_{rs}^{-1}(\lambda_2)] \times R_{rs}(\lambda_3) \times a^*_{ph}{}^{-1}(\lambda_1)$ was presented to estimate Chla contents for Shitoukoumen Reservoir, as a typical example of inland Case-Ⅱ waters. According to the optical characteristics of waters studied, spectral regions included in the model were tuned to eliminate other interferences such as the variability of Chla fluorescence quantum yield, which resulted in the optimal positions for λ_1, λ_2 and λ_3 at 668nm, 678nm and 717nm respectively. Compared with the previous three-band model, the improve model gave out a much better estimating performance with a high coefficient determination (0.92) and a low root mean squared error (0.88μgl^{-1}). Although the findings underline the rationale behind the improved model, an extensive database containing data in different water conditions and water types is required to test the accuracy of the model.

Keywords: Remote sensing, Chlorophyll-a, Model, Inland Case-Ⅱ waters, Shitoukoumen Reservoir

No. 098

Analysis the Ecological Environment Change by Geoinformatics Technology at Special Erosion Area in Taiwan

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ABSTRACT

Due to the poor condition of soil and micro-climate condition, the mudstone area in the southwestern Taiwan has been difficult for plants to grow. The area is always in such a bare condition that it is nicknamed "Moon World." Serious erosion and natural disasters in the mudstone area are the significant problems for soil and water conservation, and the area of bald mudstones is expanding. Statistical data show that bare area has increased 3 times during the past 10 years. The mudstone area in the southwestern Taiwan was hard to plant and then it always in bare condition which got a nickname of The Moon World. The distribution of each land-use type in mudstone area, and spatial information in years were integrated into GIS by ArcView. In the respect of ecosystem, ecological index in different periods were calculated based upon landscape ecological theory. To explain its meanings and the danger behind the bare mudstone area, the results indicated that mosaic gathering was caused by mudstone and thorn bamboo. The results illustrated that the ecological factor of landscape such as patch shape factor, and Shannon evenness factor that have significant canonical correlation with water qualities and erosion of the study area. In study area, there are many styles of fracture, variation, and mosaic distribution landscape.

Key words: GIS, environment degradation, landscape change, landscape metric, factor analysis

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No. 099

A Study on Human Driving Mechanism of Land Use/Cover Change in Rural Villages from Microscale: A Case Study of Zhaigou Village and Zhuangshang Village

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ABSTRACT

At present the study on land use/cover change from microscale in the typical district is one of the important studies of the LUCC. And the Participatory Rural Appraisal (PRA) is also a widely adopted research method in this field. In this article, we selected a typical district in the mountain areas of west Henan province and studied the human driving mechanism of LUCC by means of PRA from the microscale. The conclusion is that the action of the committee of the villages, the policy, the concept of rural inhabitants, comparative advantage and the development of rural economy are the main driving factors at the typical district in Yiluo River Basin.

Keyword: Participatory Rural Appraisal (PRA); Driving Mechanism; Land Use/Cover Change (LUCC); Typical Sample

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No. 100

Application of GIS in Improving the Accessibility of Post Office

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ABSTRACT

For postal industry, an integrated collection-delivery network is an important component for its effective and sustainable operation. It contributes to reduce the cost and improve service quality. Appropriate spatial pattern brings efficient spatial performance. Generally, however, the planning of postal service is based on professional experience and certain design criterion, other than on a scientific deductive system. Thus we dedicate to make use of a recently developed location-allocation model to deduce an appropriate spatial pattern for urban postal facilities. By doing so, the accessibility of postal service to local resident will be improved greatly. Location-allocation model, as its good performance on optimal site selection, is used to evaluate and optimize the spatial pattern of postal facilities. After integrated with GIS, the model can generates a set of solution spaces that help decision makers to narrow down their searches and decisions for site selection. It can also be used to test different scenarios by varying the objectives to be considered, and the type of location-allocation model can be changed according to the need of planners and decision makers. To demonstrate the process, the optimal site selection problem around Yichang, a middle scale city of central China, is selected as an example.

Keywords: Location-allocation model, optimal site selection, spatial pattern, GIS

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No. 101

Positional uncertainty of manual digitization vertex based on simulation test

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ABSTRACT

The theoretical models of positional uncertainty of vertexes have been derived from overlay of the error ellipse models that are considered as the positional uncertainty models of line endpoints. Using probability theory and simulation tests, we mainly study the positional uncertainty characteristics of manual digitization vertex. The research results are as follows: first, using the method, that is sequentially digitizing a series of vertexes with different turning angles, repeating about six hundred times, we can get the stable distribution of frequency of digitizing points; second, in the direction of the angular bisector of turning angle, with the value of turning angle increased, the digitizing points from digitizing vertexes have a trend for gather, and the frequency distribution whose peak is less than three shows skewness, while in the direction of the perpendicular angular bisector of turning angle, digitizing points of vertexes with the acute turning angles are more concentrated than the ones with obtuse angles, and the distribution performs a state of symmetric but not the standard normal distribution; third, two dimensional uncertainty model of digitizing vertexes whose plane projection is a type of irregular geometric shape is a joint distribution model combined by skew distribution and approximate normal distribution.

Keywords: Vertex, Manual Digitization, Turning Angle, Positional Uncertainty, Distribution Law

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No. 102

Quantitative Analysis of Ecological Effects for Land Use Planning Based on Ecological Footprint Method -A Case Research in Nanyang City

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ABSTRACT

The research of coordinated development between land use and ecological building is a new problem with the development of country economy, whose intention is to improve economy development and protect eco-environment in order to realize regional sustainable development. Evaluating human effects on the ecosystem by a comprehensive, scientific and quantitative method is a critical issue in the process of general land use planning. At present, ecological footprint methodology, as an excellent educational tool applicable to global issues, is essential for quantifying humanity's consumption of natural capital, for overall assessments of human impact on earth as well as for general land use planning. However, quantitative studies on the development trends of ecological footprint (EF) time series and biological capacity (BC) time series in a given region are still rare. Taking Nanyang City as a case study, this paper presents two quantitative estimate indices over time scale called the change rate and scissors difference to quantitatively analyze the trends of EF and BC over the planning period in general land use planning form 1997-2004 and to evaluate the ecological effects of the land use general planning form 1997 to.2010. The results showed that: ①In Nanyang city, trends of the per capita EF and BC were on the way round, and the ecological deficit enhanced from 1997 to 2010. ② The difference between the two development trends of per capita EF and BC had been increasing rapidly and the conflict between the EF and BC was aggravated from 1997 to 2010. ③The general land use planning (1997 - 2010) of Nanyang city had produced some positive effects on the local ecosystem, but the expected biological capacity in 2010 can hardly be realized following this trend. Therefore, this paper introduces a "trinity" land use model in the guidelines of environment-friendly land use pattern and based on the actual situation of Nanyang city, with the systemic synthesis of land utilization of the cities, the village and the suburb as a principal part and the land development reorganization and the ecological environment construction as the key point.

Keywords: land use planning; ecological footprint; change rate; scissors difference; environment-friendly; Nanyang City

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No. 103

Modeling Chlorophyll-a Concentration in Taihu Lake Based on different Trophic State

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ABSTRACT

In this paper, we want to search for the hyperspectral remote sensing bands most sensitive to chlorophyll-a concentration in different trophic states. Through repeated measurements in Taihu Lake, a large quantity of hyperspectral reflectance data and chlorophyll-a concentration data of lake were obtained from June to September of 2004 and 2005. The eligible hyperspectral data were analyzed to calculate remote sensing reflectance of water in Taihu Lake, and the data of chlorophyll-a concentration obtained from laboratory analysis were used to calculate Trophic State Index. According to the actual condition of Taihu Lake, the hyperspectral data were divided into three groups: mesotropher, eutropher and hyper eutropher. In each trophic state, chlorophyll-a concentration was then regressed against to identify the most sensitive hyperspectral bands. From the established regression models, we can get the conclusion: chlorophyll-a concentration is correspondingly lower under mesotrophic state, badly influenced by suspended matter, the spectral feature of chlorophyll-a is not evident, and the accuracy of regression model in this trophic state is not so satisfactory; in eutrophic state, differential algorithm has better retrieval result, the linear model based on this algorithm has the best estimation result; under hyper eutrophic state, the estimation accuracy is higher than the other two states as a whole. The fitting precision is the highest using the band ratio R719/R670 as independent variable in the quadratic equation model.

Keywords: Chlorophyll-a Concentration; Trophic State; Retrieval Models

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No. 104

Remote Sensing Monitoring Mechanism Model for Heavy Metal Cd Pollution in Rice Farmland Based on Hyperspectral Data

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ABSTRACT

As one of the significant ecological environment problems, heavy metal pollution associates closely with environment quality, human existence and security of food supplies. The remote sensing pollution mechanism in soil pollution-Cd is discussed by researching into the status of rice leaf polluted-Cd in this paper. The response relationships between remote sensing information parameters, which reflected the vegetation structure, physicochemical properties and biologic parameters of soil-vegetation system, and soil polluted degree by Cd element are analyzed based on Hyperion satellite data and a great number of ground experiment data. To extract remote sensing parameter to Cd pollution, multiple discriminant analysis (MDA) was applied over the data, which is sensitive to rice chlorophyll, rice leaf moisture, rice cell structure and rice LAI. The remote sensing mechanism models of Cd pollution in rice soil are established, including MCARI-NDWI model, MCARI-RVSI model, MCARI-RVI model, NDWI-RVSI model, NDWI-RVI model and RVSI-RVI model. The research results indicated that the pollution monitoring of soil Cd element in large scale might carry on initially according to these models, because different Cd pollution degrees are in different positions of these models, however, the precision of pollution models need be further improved.

Keywords: Cd pollution, rice leaf, hyperspectral remote sensing, mechanism analysis

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No. 105

GIS-aided port area plane design on project for Dongluo island-port in Fuzhou

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ABSTRACT

Up to now, the site selection of deepwater port has become a hot issue in the construction and planning of many estuary port cities. At the same time, there are various schemes about the location of deepwater port in Fuzhou and different opinions on them. Under this background, a new project for Dongluo Island-Port has been put forward. Port engineering has distinct spatial attributes, so its design is closely related to geographic spatial location. According to common engineering technique standards of seaport's location and construction, this paper explores the port area plane design of the new project by spatial analysis means of GIS. Main technical processes include applying the ARC/INFO9.0 and ArcView3.2 software to build elevation data firstly, then overlay the feature coverage to the base map to implement spatial analysis, and obtain the design coverage for port area finally. Combining with technical criterions of port area plane design, the paper analyses the design effect and concludes that the berths arrangement accords with the demand of transport capacity and the items layout accords with the engineering technique criterions as well, therefore the port area plane design is technically feasible as a whole.

Keywords: Dongluo island-port, port engineering, plane design, geographic information system (GIS), Fuzhou City

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No. 106

Study on ecological impact evaluation for land consolidation based on cloud model——a case study of Miaotan town

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ABSTRACT

Combining the basic theory of cloud model and the process of ecological impact evaluation for land consolidation, the author constructs the rule of ecological impact evaluation and the cloud models of the antecedent and the consequent, by translating the uncertain factor conditions into quantitative values with the uncertain illation based on cloud model, computes the evaluation factor scores and comprehensive scores of MiaoTan, and then, comparing the results with composite index computation method and fuzzy comprehensive assessment, a feasible method used in Ecological Impact Evaluation for Land Consolidation is proposed.

Keywords: Cloud models, land consolidation, ecological impact evaluation, single factor score, comprehensive score

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No. 107

Analysis of Landscape Security Pattern in Western Mountains of Shijiazhuang

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ABSTRACT

The landscape ecology approach is an important way to study ecological security. Mountainous area is ecologically an important green defense and water source in regional areas. The significance of studying mountainous landscape ecology and environmental security is beyond words and it will be vitally important to recover the integrality of ecosystem and to deal with ecological environment. This paper is based on the remote sensing image data of 1987 and 2000, from the perspective of protecting biodiversities and ecological environment to determine the source of the study focus, and then a Minimum Cumulative Resistance (MCR) surface model has been developed using ArcGIS 9.0 and ERDAS 8.6 to establish the Minimum Cumulative Resistance surface. By analyzing landscape minimum cumulative resistance surface and the relationship between resistance value and area, the buffer area used to study ecological security can be determined, and thus determining inter-source linkage, radiating channels and strategic point. Landscape ecology security pattern can be differentiated by spatial analysis and ecology security region can be divided into high security zone, moderate security zone and low security zone. Barycenter transfer model is applied to analyze the spatial and temporal change of landscape security pattern. The result statistics indicated three points: (1)The bound of high security zone has been reduced 381.9149 km^2, with an average of 29.3781 km^2 per year, and the barycenter transferred to north-west about 2.07 km; (2)The bound of moderate security zone has been increased 60.5418 km^2, with an average of 4.6571 km^2 per year, and the barycenter transferred to north-west about 3.99 km; (3)The bound of low security zone has increased 321.3731 km^2, with an average of 24.7210 km^2 per year, and the barycenter transferred to north-west about 2.07 km. The reasons are as followed: although the voice to protect ecological environment has been shouted up and up and the government indeed has made greater efforts to protect our environment, the rapid economic development is continuing making the plundering of resources and environmental pollution even seriously in the western mountainous area.

Keywords: Mountainous area, landscape security pattern, resistance surface, barycenter transfer model

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No. 108

Toward an integrated Data Quality Analysis and Assessment System for HJ satellite constellation

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ABSTRACT

The small satellite constellation for environment protection and disaster monitoring (HJ satellite constellation) is facilitated to satisfy the country and surrounding countries or regions' need of dynamic monitoring and forecasting environment and disaster through the use of remote sensing. HJ-1A and HJ-1B will be launched in 2008 and the ground system of which is being developed in accordance with the technical demands of their owners. The quality of data acquired by onboard sensors is essential to effective application of the data, which is also a measure of the success of the engineering and science efforts of operational satellite program. To systematically monitor and measure the sensors' in flight performance and data quality, we designed an integrated Data Quality Analysis and Assessment System (DQAAS) for HJ satellite constellation's ground system, and are developing a demonstrating DQAAS system, which is also a part work of Sky-To-Earth System of Systems (STESS). This paper first analyzes the necessities to include a Data Quality Analysis and Assessment System in the ground system of HJ satellite constellation. Upon the analysis of the function requirements of DQAAS, the framework and structure of DQAAS is presented. The operation flow and interfaces definition is very important for an integrated system, which is also included in the paper. At last, the functions and algorithms of Data Quality Assessment Subsystem are introduced in detail. We expect to promote the quality and analysis and assessment technology in China through the development of DQAAS for HJ satellite constellation.

Keywords: Data Quality Analysis and Assessment System (DQAAS), HJ satellite constellation, Sky-To-Earth System of Systems (STESS), Data Quality Assessment Subsystem

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No. 109

Simulation of urban growth using a cellular automata-based model in a developing nation's region

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ABSTRACT

Cellular automata （CA） modeling is one of the recent advances in spatial–temporal modeling techniques to the field of urban growth dynamics. A number of CA-based models of urban growth have produced satisfactory simulations of spatial urban expansion over time. The paper explained the parameters, transformation and calibration of the SLEUTH model-one specific format of the cellular automation model, on the base of which the process of urban growth of changsha city between the year 1996 and 2005 is rebuilt. Moreover the spatial morphology of Changsha city in 2015 and 2030 is separately predicted with the method of scenario simulation. The results of analysis and simulations indicate that application of the SLEUTH model to simulation of urban growth is advisable and the accuracy of simulation is acceptable.

Key word: Cellular automata; urban growth simulation; SLEUTH model; Changsha City

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No. 110

Land Cover Classification Based on Typical Indices Combinations of MODIS NDVI Time Series

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ABSTRACT

MODIS data has a high temporal and spectral resolution, and it can provide vegetation indices of high quality. By using MODIS NDVI time series with 250 m spatial resolution which were composite of 16 days in 2005, this work chose annual modulus of vector, maximum and minimum NDVI three indices to do classification. Training and validation samples were selected based on TM images and the 1:1,000,000 vegetation atlas of China. Then the land coverage map was generated using maximum likelihood classification (MLC) method. After post-classification process of the original classification result, the final land classification map of Keerqin sandy land was got in the end. The classification accuracy was assessed using validation samples and the result indicates that 250 m MODIS NDVI time series has advantage and potential in regional land coverage mapping. Also the classification method used in the paper could not only reduce the data amount and quicken the speed of classification, but also could reduce the disturbance of other invalidation information to classification and get better classification accuracy.

Keywords: MODIS, NDVI time series, land cover classification, modulus of vector, maximum, minimum

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No. 111

Formal Description of Topological Relations between Spatial Objects with a Hole

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ABSTRACT

Description and differentiation of topological relations are based on the changes of topological properties of spatial objects sets and their components before and after their intersection. There were many researches about special topological relations between two simple spatial objects, but the researches on topological relations of the spatial objects with a hole are relatively fewer. This paper uses the description frame of two spatial objects with holes, which is put forward by Egenhofer etc. Based on the 4ID, this paper put forward a new extended model which can describe special topological relations between the spatial objects with a hole. At the same time, the paper detrude 23 kinds of topological relations between a simple spatial object and a spatial object with a hole and 57 kinds of topological relations between two spatial objects which only with a hole.

Keywords: 4-Intersection-Difference model, region with a hole, topological relations, formal description

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No. 112

A Study on the Climate Change in Northwestern Hebei Mountains Area over the Past 46 Years

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ABSTRACT

The northwestern Hebei mountains area is located in the transitional area from the subhumid and temperate zone to the semiarid zone, pertaining to the ecologically fragile area. Closing to Beijing and Tianjin, the area is in the windward and upriver area of the two cities. It is of great significance to study the climate change in this area for the purpose of understanding the law of local ecological development and constructing the Beijing-Tianjin ecological protective barrier. Based on the average monthly temperatures and precipitation data collected by three weather stations in the northwestern mountains area between 1956 and 2001, this paper studied the climate changes in this area over the past 46 years, by analyzing the average temperature anomaly and precipitation anomaly of yearly and quarterly, calculating the five years sliding average value of them, and applying the way of univariate linear regression to get linear regression equation of the five years sliding average value. Preliminary research was conducted on the average temperature anomaly and precipitation anomaly values and their development trends with the adoption of correlation analysis. Discussion on factors causing the climate change was carried out. The result shows that the average temperature was on an upward trend in the period 1956-2001 at a rate of 0.41℃/10a, with the highest growth rate seen in winter. In contrast, the annual precipitation was on decrease during the same period at a rate of 7.765mm/10a, with the highest rate seen in summer. The area under research is turning warmer and drier. The correlation analysis indicates no apparent correlation between the upward annual average temperature and the downward precipitation, which should be regarded as a process of independent change. This paper also explores the possible causes that have affected the climate in this area, including the global warming, the climate change in a larger area such as the circulation of water vapor in East Asia as well as the changes to local ecological environment such as pollution, greenhouse gas emissions, increased particulate matters in the atmosphere, ecological damages, etc.

Keywords: average temperature anomaly; precipitation anomaly; change analyze; northwestern Hebei mountains area

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No. 113

Analysis of events in 3D building models

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ABSTRACT

This paper addresses the nature of events in 3D building models. Events are characterized by their structures, tenses and temporal attributes. They can be also distinguished in different types in terms of changes in geometries, attributes and textures. There are up to 13 temporal topologic relationships between two arbitrary events of different lifespan. These relationships may change with varying temporal resolutions. On the basis of the inherent dependence that exists between the spatial and temporal resolutions, a mathematical model is established to describe the relative significance of an event that occurs to geometries or façade textures. Since 3D buildings are the most important object type that characterizes the dynamic nature of a city, the investigations on their events can serve as a conceptual basis for modeling, acquisition, visualization and retrieval of a 4D virtual city environment.

Keywords: Event, Time, 3D Building model, temporal relation, temporal resolution, spatial resolution, mathematical model

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No. 114

Integrating GIS and Urban Spatial System Dynamic Model for Urban Expansion Analysis

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ABSTRACT

Urban evolution model is an assistant analysis method for urban planning which can effectively trace the urban development process of the past and predict the possible evolution scenarios in the future. This paper proposed urban spatial system dynamic model (USSD model) by coupling strategy between Geographic Information System (GIS) and urban System Dynamic (SD). GIS can deal with the static spatial relationships while SD can deal with the dynamic relationships of complex spatial system. This new urban expansion model can predict the expansion scenarios in the future according to tracing the urban development of the past. It considered the spatial relationships among urban system elements as well as the dynamic links and interactions among the spatial elements over time. It is achieved through a dynamic data exchange between GIS and SD. Firstly we analyzed urban system by using five subsystems: population, resources, transportation, land usage and soil erosion. Secondly, we have developed USSD model based on dynamic links among the subsystems. Thirdly, we have created five layers in GIS and operated them in the USSD model. Finally, a case study illustrated the USSD model in Wuhan city. It is concluded that the USSD model is an efficient tool for forecasting the urban expansion with its advantages on dealing with the spatio-temporal problem.

Keywords: Geographic Information System (GIS), System Dynamics (SD), Urban Planning, Urban Spatial System Dynamic model (USSD model)

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No. 115

Spatial scaling of net primary productivity using subpixel landcover information

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ABSTRACT

Gridding the land surface into coarse homogeneous pixels may cause important biases on ecosystem model estimations of carbon budget components at local, regional and global scales. These biases result from overlooking subpixel variability of land surface characteristics. Vegetation heterogeneity is an important factor introducing biases in regional ecological modeling, especially when the modeling is made on large grids. This study suggests a simple algorithm that uses subpixel information on the spatial variability of land cover type to correct net primary productivity (NPP) estimates, made at coarse spatial resolutions where the land surface is considered as homogeneous within each pixel. The algorithm operates in such a way that NPP obtained from calculations made at coarse spatial resolutions are multiplied by simple functions that attempt to reproduce the effects of subpixel variability of land cover type on NPP. Its application to a carbon-hydrology coupled model(BEPS-TerrainLab model) estimates made at a 1-km resolution over a watershed (named Baohe River Basin) located in the southwestern part of Qinling Mountains, Shaanxi Province, China, improved estimates of average NPP as well as its spatial variability.

Keywords: Remote sensing, Net primary productivity, spatial scaling, landcover, sub-pixel, BEPS-TerrainLab model

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No. 116

UK utility data integration: overcoming schematic heterogeneity

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ABSTRACT

In this paper we discuss syntactic, semantic and schematic issues which inhibit the integration of utility data in the UK. We then focus on the techniques employed within the VISTA project to overcome schematic heterogeneity. A Global Schema based architecture has been developed. Although automated approaches to Global Schema definition were attempted the heterogeneities of the sector were too great. Hence, a manual approach to Global Schema definition was employed. The techniques used to define and subsequently map source utility data models to this schema are discussed in detail. In order to ensure a coherent integrated model, sub and cross domain validation issues are then highlighted. Finally the proposed framework and data flow for schematic integration is introduced.

Keywords: Urban Infrastructure, Utility Assets, Heterogeneity, Data Integration, Schematic Reconciliation, GIS, Knowledge Exchange, Standards

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No. 118

New Methods of H-SVMs for the Classification of Mlulti-Spectral Remote Sensing Imagery

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ABSTRACT

Through systematically analysises of existing multi-class SVMs (M-SVMs) methods, it is shown that hierarchy multi-class SVMs (H-SVMs) can be relatively effective. Further analysis shown that existing methods that measure separability between different classes are not suitable for kernel feature space. A new method is presented for separability measure in feature space based on the characters of RBF kernel function and SVMs. Based on the new separability measure, two kinds of H-SVMs, Binary Tree SVMs (BT SVMs) and Single Layer Clustering SVMs (SLC SVMs) are presented. They are both implements of following ideal: the higher a pair of two sub-classes is in the hierarchy, the easier to separate them. In this way, we can not only achieve classification accuracy by alleviate error accumulation from top to bottom, but also rise classification speed by reduce support vectors in classifier. Experimental results justify the rationality of the new separability measure and effectiveness of BT SVMs and SLC SVMs.

Keywords: Class hierarchy, SVMs, separability measure, BT-SVMs, SLC -SVMs

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No. 120

Research on spatio-temporal ontology based on description logic

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ABSTRACT

DL, short for Description Logic, is aimed at getting a balance between describing ability and reasoning complexity. Users can adopt DL to write clear and formalized concept description for domain model, which makes ontology description possess well-defined syntax and semantics and helps to resolve the problem of spatio-temporal reasoning based on ontology. This paper studies on basic theory of DL and relationship between DL and OWL at first. By analyzing spatio-temporal concepts and relationship of spatio-temporal GIS, the purpose of this paper is adopting ontology language based on DL to express spatio-temporal ontology, and employing suitable ontology-building tool to build spatio-temporal ontology. With regard to existing spatio-temporal ontology based on first-order predicate logic, we need to transform it into spatio-temporal ontology based on DL so as to make the best of existing research fruits. This paper also makes a research on translating relationships between DL and first-order predicate logic.

Keywords: Spatio-temporal ontology, Spatio-temporal relationship, OWL, Description logic, First-order predicate logic

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No. 121

Study on Uncertainty of Geospatial Semantic Web Services Composition based on Broker Approach and Bayesian Networks

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ABSTRACT

The Semantic Web has a major weakness which is lacking of a principled means to represent and reason about uncertainty. This is also located in the services composition approaches such as BPEL4WS and Semantic Description Model. We analyze the uncertainty of Geospatial Web Service composition through mining the knowledge in historical records of composition based on Broker approach and Bayesian Networks. We proved this approach is effective and efficient through a sample scenario in this paper.

KeyWords: Geospatial Web Services; Uncertainty; Bayesian Networks; Services Composition; Historical Records.

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No. 122

Land degradation mapping based on Hyperion data in desertification region of northwest China

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ABSTRACT

Desertification is an alarming sign of land degradation in Henshan county of northwest china. Due to the considerable costs of detailed ground surveys of this phenomenon, remote sensing is an appropriate alternative for analyzing and evaluating the risks of the expansion of land degradation. Degradation features can be detected directly or indirectly by using image data. In this paper, based on the Hyperion images of Hengshan desertification region of northwest china, a new algorithm aimed at land degradation mapping, called Land Degradation Index (LDI), was put forward. This new algorithm is based on the classified process. We applied the linear spectral unmixing algorithm with the training samples derived from the formerly classified process so as to find out new endmembers in the RMS error imagine. After that, using neutral net mapping with new training samples, the classified result was gained. In addition, after applying mask processing, the soils were grouped to 3 types (Kappa =0.90): highly degraded soils, moderately degraded soils and slightly degraded soils. By analyzing 3 mapping methods: mixture-classification, the spectral angle mapper and mixture-tuned matched filtering, the results suggest that the mixture-classification has the higher accuracy (Kappa=0.7075) than the spectral angle mapper (Kappa=0.5418) and the mixture-tuned matched filter (Kappa=0.6039). As a result, the mixture-classification is selected to carry out Land Degradation Index analysis.

Keywords: Land degradation index, Mixture-classification, Spectral angle mapper, Mixture-tuned matched filtering, Endmember

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No. 123

Building Detection and Extraction from Monocular Imagery by Pose Clustering and Matrix Search Algorithm

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ABSTRACT

This paper is focused on the task of building extraction from high resolution imagery, which is primarily comprised of two steps. The first one is the building location by modified pose clustering, and the second is building extraction using a novel matrix search algorithm. As a generate-and-test algorithm, pose clustering produces some building hypotheses based on vote accumulation, aimed at image subsets likely to contain just a building. After building hypotheses verification, some false alarms could be eliminated based on geometric rules. Then we focus on image subsets, each of which is a potential region containing a building. Most buildings are comprised of orthogonal and sequential corners. We classify the corners into four types according to the orientation of corresponding edges. Each type of corners is labeled with a tag for identification, such as ABCD, etc. Building contained in each image subset can be represented as a tag sequence. Based on the tag sequence and the matrix formed by the dominate line sets, we develop an efficient matrix searching algorithm to address the task of extraction. The experiments carried out in our system show the promising potential of this scheme.

Keywords: Building extraction, Repository, Line extraction, Matrix search, Pose clustering, Object recognition

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No. 124

Intercity Commute Patterns in Central Texas

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ABSTRACT

There are highly populated regional corridors that connect multiple cities in different parts of the world. Public transportation is believed to be a good solution to ease traffic congestions in these corridors. To make informed decisions about public transportation planning, we must have a clear picture about commuting patterns in a corridor. Although the study of commute patterns has a long tradition in urban planning, urban geography, and transportation analysis, the examination of intercity commute patterns in urban corridors consisting of multiple cities has received limited attention. This study aims to achieve a better understanding of intercity commute patterns and flows in a five-county study area in Central Texas. We used GIS methods and network analysis procedures to analyze the U.S. 2000 Census Transportation Planning Package (CTPP) Part 3 Journey–to-Work data. Results from the analyses suggest that: (1) most (>97%) of the workers with their homes in the five-county area also worked in the area; (2) the number of people who worked in the five-county area exceeded the number of people who had their homes in the area; and (3) most of the intercity commuting trips were between cities located within the same metropolitan area.

Keywords: intercity commuting, transportation, GIS, network analysis, transit, urban planning

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No. 125

Development of a forestry government agency enterprise GIS system, a disconnected editing approach

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ABSTRACT

The Texas Forest Service (TFS) has developed a geographic information system (GIS) for use by agency personnel in central Texas for managing oak wilt suppression and other landowner assistance programs. This Enterprise GIS system was designed to support multiple concurrent users accessing shared information resources. The disconnected editing approach was adopted in this system to avoid the overhead of maintaining an active connection between TFS central Texas field offices and headquarters since most field offices are operating with commercially provided Internet service. The GIS system entails maintaining a personal geodatabase on each local field office computer. Spatial data from the field is periodically up-loaded into a central master geodatabase stored in a Microsoft SQL Server at the TFS headquarters in College Station through the ESRI Spatial Database Engine (SDE). This GIS allows users to work off-line when editing data and requires connecting to the central geodatabase only when needed.

Keywords: Enterprise GIS, disconnected editing, geodatabase, government GIS, natural resource information management

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No. 127

Primary Discussion on the Relationship between Spatial Distributions of Fuzzy Slope Positions and Soil Types

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ABSTRACT

As one of key factors which control the spatial soil variation in soil-landscape model, terrain information includes not only topographic attributes (such as slope gradient, curvature, etc.) but also information of slope positions. But the spatial gradation of slope positions is still not quantitatively considered in current predictive soil mapping and other related application areas. The issue of this paper is to make a primary discussion on the potential role of spatial gradation of slope positions in soil-landscape model. Taking a study area in Northeast China and a detailed taxonomy of slope position, this paper firstly utilized a fuzzy inference approach based on similarity to the typical locations to quantify the spatial gradation between slope positions. Secondly, we took use of the soil-subgroup map in study area to analyze whether there is an evident relationship between soil distribution and spatial gradation of slope positions or not, by means of the statistics on the percentage of slope positions on where each soil subgroup in study area is distributed. The results show that the distributions between slope positions and soil subgroups are clearly correlative in the areas where fuzziness as one certain slope position is little. And the soil distribution shows obvious intergradation and uncertainty in areas where the slope position is identified with much ambiguity. The evident relationship between soil distribution and spatial gradation of slope positions indicates that the quantitative information of spatial gradation of slope positions should be included into both soil-landscape model and its applications (e.g., digital soil mapping, etc.), for a better depiction on the co-variation between slope positions and soil type.

Keywords: Digital terrain analysis, slope position, spatial gradation, soil-landscape model, soil subgroup

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No. 128

The Design and Implementation of GML Data Management Information System Based on PostgreSQL

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ABSTRACT

GML expresses geographic information in text, and it provides an extensible and standard way of spatial information encoding. At the present time, the management of GML data is in terms of document. By this way, the inquiry and update of GML data is inefficient, and it demands high memory when the document is comparatively large. In this respect, the paper put forward a data management of GML based on PostgreSQL. It designs four kinds of inquiries, which are inquiry of metadata, inquiry of geometry based on property, inquiry of property based on spatial information, and inquiry of spatial data based on location. At the same time, it designs and implements the visualization of the inquired WKT data.

Keywords: PostgreSQL, GML, WKT, inquiry, visualization

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No. 129-2

CoreP2P: a Tailored Group Communication Scheme for P2P-Grid GIS

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ABSTRACT

The data-intensive and computation-intensive characteristics of the geo-processing require scalable, flexible, and distributed geo-computing platforms. We employ P2P and Grid technologies to construct a prototype of P2P-Grid GIS, which can integrate distributed spatial data and computing resources to accomplish complex and large-scale spatial processing tasks. The JXTA is a general P2P toolkit originally used in our system. It has many modules and functionalities unnecessary for the prototype, which prove to decrease the system performance. Therefore, we design our own P2P communication scheme called CoreP2P. In this paper, we firstly give a brief description of the architecture of P2P-Grid GIS. We also identify the group communication requirements in the P2P-Grid GIS, which include spatial data transfer and control message transmission. Then, we discuss the components of CoreP2P and their respective functionalities in detail. Finally, we build the P2P-Grid GIS based on CoreP2P and compare the performance with JXTA-based system.

Keywords: GIS, P2P-Grid, CoreP2P, Peer, Peer group, group communication

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No. 130

On the Performance of Endmember Extraction Algorithms for Hypersepctral Image Analysis

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ABSTRACT

In this paper, we investigate the performance of an endmember extraction algorithm when it is implemented in different fashions. The implementation fashion is changed by the use of a dimensionality reduction process, parallel or sequential mode. This results in four different versions of a single algorithm. We take the Automatic Target Generation Process (ATGP) algorithm as a study case due to its excellent performance. The experimental results show that a dimensionality reduction process can not only reduce computational complexity but also improve performance by compacting useful information into a low-dimensional space; the parallel mode can provide better performance than the sequential mode with the increase of computational complexity. Instructive recommendations in the selection or implementation of endmember extraction algorithms for practical applications are provided.

Keywords: Hypespectral Image Analysis. Endmember Extraction. Linear Mixture Analysis.

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No. 131

Geographic Information System Data Sampling Design and Implementation

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ABSTRACT

This paper discusses the importance of sampling in Geographic Information Systems (GIS), and briefly summarizes the classical sampling theories of simple random sampling, systematic sampling and stratified sampling. The main purpose of this paper is to introduce the architecture of spatial sampling software named as Sandwich Spatial Sampling Package. In this software, the steps of sampling include calculating sampling size, distributing samples, calculating and displaying sampling results. The first step can be divided into four parts: setting configuration files, selecting sampling fields and relative parameters, inputting parameters to calculate sampling sizes and displaying calculated results to help users choose the best function to calculate sampling size.

Keywords: Sampling theory, Sampling Software, Sandwich sampling, Spatial sampling, GIS

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No. 132

Analysis on Characteristics and Trend of Shoreline Evolvement in the Yellow River Estuary

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ABSTRACT

In recent years, the runoff and sand transportation of the Yellow River is declining, the corrosion of shoreline in the Yellow River Delta becomes more and more serious, and this brings up much hidden trouble for the inshore biological environment and engineering facilities. In this article, according to RS and GIS, we analyzed the muti-temporal RS image between 1987 and 2003, abstracted the spatial-temporal information of the shoreline using unsupervised classified method. Built the quantificational-relative model between the runoff and sand transportation and the corrosive area of shoreline based on data from Lijin Hydrology Station and statistical method, and did elementary forecast on the evaluative trend of the shoreline.

Keywords: The Yellow River Estuary; Shoreline; Dynamic monitoring; Runoff and sand transportation; remote sensing

No. 133

Quantitative analysis and monitoring of soil erosion based on RS and GIS technology: Case study of Makeng area in Fujian province

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ABSTRACT

Mining environmental problems becoming increasingly serious is a key factor that prevents sustainable development of mining industry. Destruction of surface vegetation that cause soil erosion and ecological environment deterioration are some of the main problems of geological environment in mines. This paper takes Fujian Province Makeng area as an example, using RS technique to extract the vegetation cover and land use/cover change, and GIS technique to extract elevation and soil information. This research adopted an integrated application of RS and GIS spatial analysis functions which can quickly, accurately and economically be used to make the range and the quantitative analysis of monitoring and evaluation soil erosion in 1998 and 2004. The research outcome is a basis for the renovating mining environment and protecting eco-geological environment.

Key word: GIS; RS; soil erosion; quantitative evaluation

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No. 134

Research on Monitoring Tobacco Fields by Multi-source Remote Sensing Data

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ABSTRACT

Tobacco is one of important crops in our country, and brings the significant irreplaceable effect into playing in countrywide economic growth. So the monitoring and scientific management of tobacco fields show especially important to us. To monitor growing crops in a large scale is a complicated problem and a satisfied method to know what the way a crop is growing has been sought by the scientists in the field. At present, the study of tobacco remote sensing monitoring is less both at home and abroad. In this paper, we try to obtain tobacco field and area by remote sensing with Yunan Province Honghe State Tobacco County as example. We adopt rejecting interfering tobacco field information classification method of supervision while monitoring and get an ideal result. Simultaneity, we also offered the suggestion of further improving classification precision.

Keywords: Tobacco field, Remote sensing monitoring, Image classification, Multi-source

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No. 135

Monitoring the naked croplands in Beijing with multi-temporal remote sensing images

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ABSTRACT

Naked cropland elimination is an important part of Beijing Olympic ecological project. In this paper, Multi-temporal satellite data were used to monitor and position the naked croplands. Three Landsat TM images and two "Beijing-1"Micro-Satellite images were selected to calculate NDVI series according to crop phenological calendars and investigated information of agricultural cropping structures in Beijing suburb. Based on the phenological spectral characteristics of main agricultural land use types, a classification scheme was proposed to extract the naked croplands. Considering the structural characteristic hierarchical classification and various demands of feature selection in different periods, decision tree algorithm and a stepwise masking technology were employed to extract typical crops in each season, and hence the naked croplands were left. Accuracy assessment of the naked croplands in winter and spring were performed with comparison of the monitoring areas with statistical data. The results show that the area of the naked croplands in winter and spring was 170368.1ha in Beijing. The areas of the top five districts (Yanqing, Shunyi, Daxing, Miyun and Tongxian) were 17933.3ha, taking a percent of 69.2% of that of Beijing. The areas of the naked cropland were 25719.6 ha, 4485.4 ha and 3325 ha in summer, autumn and all the year round respectively. Experimental results demonstrated that our method would fast and simply monitor agricultural land use.

Keywords: Naked cropland, Multi-temporal, Monitoring, Crop phenological calendars, Vegetation index

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No. 136

Study of geological hazard's assessment on coastline change

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ABSTRACT

In order to discuss the coastal geological hazard assessment method, the author chooses the typical hazards caused by the change of coastline as object of study. The fuzzy hierarchy comprehensive evaluation approach based on GIS is applied to study and demonstrate the main principle and process of coastal hazard assessment. then, taking Bao'an district of Shenzhen as example, we carried on hazard assessment on the change of coastline by using fuzzy hierarchy evaluation method based on GIS . And then conduct the regionalization research of coastal geological hazard. The data of three periods is selected to explain the coastline change. The result of remote sensing's data indicate that apart from the west seacoast which has no basically change , the coastline change of Baoan district is quite obvious during the seventeen years form 1989 to 2006.

Keywords: The change of coastline, geological hazard, fuzzy hierarchy comprehensive evaluation, GIS

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No. 137

Extraction of ore-searching information of uranium deposit based on high spatial resolution satellite data

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ABSTRACT

Uranium deposit has very important status in our national defiance and economy qua a kind of strategic mineral resources. It is important to point out which information should be extracted as ore-searching ones of uranium deposit. In this study, a kind of high spatial resolution satellite data-QuickBird satellite data, with 0.6m class panchromatic (Pan) and 2.4m multi-spectral stereoscopic data, was used to extract the ore-searching information of uranium deposit in Bashibulake area at the north of Tarim basin. By using effective methods of image processing, the information of ore-bearing bed, ore-control structure and mineralized alteration have been extracted successfully. The results show a high consistency with the field survey. The aim of this study is to explore practicability of high spatial resolution satellite data for prospecting minerals, and to broaden the thinking of ore-searching at similar areas.

Keywords: High spatial resolution; uranium deposit; ore-search information; extraction

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No. 138

Study on the spatial variability of heavy metals in the soil of geo-authentic productive area of Ligusticum chuanxiong Hort. based on GIS and BP-Kriging

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ABSTRACT

Based on the laboratory analysis result of heavy metals in geo-authentic productive area's soil of Ligusticum chuanxiong Hort., this paper studied the spatial variability and the geographic distribution of the heavy metals in the soils of fifteen specimens by the GIS and BP-Kriging, such as Cu, Pb, As, Cr, Hg, Cd .The results showed that the way of BP-Kriging could carry out a relatively accurate spatial analysis to even a small group of data and manifest the structural or regional character and the randomicity of the elements in soil. By the research, it could provide a scientific way for the distribution and GAP production of Ligusticum chuanxiong Hort. growing in Sichuan province.

Keywords: Spatial variability; Heavy metals; Ligusticum chuanxiong Hort.; GIS; BP-Kriging

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No. 139

A Reasoning Method of Spatial Relations on the Spherical Digital Space

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ABSTRACT

Spatial relation between spatial objects is a very important topic for spatial reasoning, query and analysis in global GIS. However, the most popular models in current use, which are based on the 2D Euclidean space (such as raster), exist some fundamental deficiency in theory for spatial relation reasoning in the spherical digital space (SDS). In this paper, a reasoning method of spatial relations in the SDS based on manifold is approached, in which: (1) the topological definitions, properties, and descriptions of spatial objects in SDS are presented; (2) appropriate operators from set operators (i.e. intersection, difference, difference by, symmetric difference, etc.) are utilized to distinguish the spatial relations between neighboring spatial objects; and (3) the value of the *Euler number* of symmetric difference is used for the detailed computational results of set operations; In this method, the 8 types basic topological relations between spatial objects in SDS can be distinguished accurately and easily from simple to detailed level for different requirements.

Keywords: Spherical digital space; Spatial relations; Manifold; Multi- operators

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No. 140

The Congenital Defect of GPS Single Epoch Ambiguity Resolution

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ABSTRACT

The main problems of GPS positioning are ambiguity resolution and repairing cycle slips. The mode of surveying may be static, fast static, kinematic or real-time kinematic(RTK). They have one common, important constraint: they are multi-epoch algorithms. For many engineering sites, where the signal may be interrupted and cycle slips occur quite frequently, the above methods have difficulty in resolution of ambiguity. Then the research attention has been focused on single epoch processing techniques, which are independent on cycle slips. Traditional single epoch processing algorithm has such problems as less chances for success, bad reliability and separability, etc. The less success chances results neither from low accuracy of trial positions, nor from less redundancy of observable, low signal to noisy ratio(SNR) and multi-path effect. The congenital defect of GPS single epoch ambiguity resolution has be proved if this contribution, i.e., once the ambiguity candidates lie in the null-space of coefficient matrix of the conditional adjustment, which leads an arbitrary group of ambiguities may estimate a small residual of observations and infinite groups of ambiguities whose variance can be as small as possible in GPS single epoch ambiguity resolution, we can not distinguish between the local minimum and global minimum by one epoch data.

Keywords: GPS, single epoch ambiguity resolution, null-space

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No. 141

Research on Optimal Allocation Model of Land Resource based on Niche and CA

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ABSTRACT

Land resource optimal allocation has always been one of the most challenging issues in land science field. The classical methodologies and theories of land resource allocation optimization pay more attention to the economic benefit and ignore the environmental benefit and the ecological benefit, Which has breached the sustainable development; moreover, it devote more attention to the amount structure optimization and ignore the spatial configuration optimization. In recent years, Many researchers bring forward some integrated models, Which realized the social、ecological and economic benefit. But nearly nobody can construct the integrated model which could combine the amount structure optimization with the spatial configuration optimization. This article use niche model to optimize the land amount structure and simulate the spatial configuration based on CA.

Keywords: Niche, CA, amount structure optimization, spatial configuration optimization

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No. 142

The integration of multi interactive patterns in Virtual Geographic Environment

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ABSTRACT

Virtual Geographic Environment will be a modeling system supporting geographic analysis and visualization for geographic research on modern distributed, heterogeneous network environments. It allows users at different geographic locations sharing spatial information and interacting with each other via Internet. This paper proposes a new multi pattern interactive architecture for presenting different application patterns. The architecture for the integration of multi interactive patterns is separated into three main function layers: Data Layer, Virtual Geographic Environment Layer, and Application Layer. With the multi pattern interactive architecture, the Virtual Geographic Environment behaves itself with multiple application features, each of which is managed by a uniform object which is named "Entity". The object-oriented conceptual modeling mechanism is presented by "Entity" and the relationship between them. In order to fulfil the various interactive patterns of the Virtual Geographic Environment according to the users' requirements, multiple application aspects are integrated dynamically, such as Geo-spatial data sharing, Geographic model integration, two-dimensional map, three-dimensional simulation and so on.

Keywords: multi interactive patterns, integration, object-oriented conceptual modeling, Virtual Geographic Environment

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No. 143

The quality-aware GIS supported by web based geocomputational tool

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ABSTRACT

Spatial data quality issues have been put in high priority in GIS community as the increasing share and use of geospatial data, especially when Internet technology became the new medium for delivering digital data to its large audience. However, the current lack of error-sensitive functionality has been exposed and found in many GI systems. Thus, to enhance current GIS with quality aware functions and provide users with the geospatial data of adequate quality becomes a big challenge. This paper focuses on improving and supporting the spatial data integrity in field based Mobile GIS. It examines current approaches of ensuring spatial data integrity and proposes a rule-based means for specifying data integrity requirements. Then the quality-aware GIS concept is introduced, and based on that, a geocomputational tool prototype for interpreting integrity rules and performing the error checking in Mobile GIS is developed. Its functionality corresponding to the detailed field data capture scenarios is introduced. This geocomputational tool has a generic architecture, and it is implemented as the extended geospatial web functions to enhance standardized geospatial web services (OGC WFS). Therefore it can also be easily employed by other different quality-aware GIS applications such as data reprocessing, data analyzing and so forth.

Keywords: spatial data integrity, quality-aware GIS, geospatial web services, Mobile GIS

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No. 144

A Sub-pixel based Method to Extract and Interpret Information from Image and its Preliminary Application

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ABSTRACT

Resolving sub-pixel area information extraction has gained increasing attention in the remote sensing community. Automated morphological endmember extraction (AMEE) which integrates spatial and spectral information to select endmembers, is able to provide a relatively good characterization of general landscape conditions. As tradition support vector machine (SVM) predicts only class label, in order to obtain the abundance fractions of targets of interest, SVM method can be combined with pairwise coupling. This paper describes a model which combines SVM approach and AMEE algorithm. One of the main advantages of using this model is that it performs automatic sub-pixel information detection. At last, simulated and real Landsat TM data are used to demonstrate the potential of this approach.

Keywords: Automated morphological endmember extraction (AMEE), support vector machine (SVM), pairwise coupling (PWC)

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No. 146

An Application of Temporal-GIS in Displaying Geospatial Polygon

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ABSTRACT

Geospatial information contains not only spatial information and attribute information, but also the information related with spatial information evolvement. As the development of the instruments and technology to acquire geospatial information, more and more geographical information contains spatial-temporal information, as a result, temporal-GIS(Temporal-Geographic Information System, TGIS for short) comes into being. Temporal-GIS could analyze and solve the spatial evolvement characteristics in geographical phenomenon, and reproduce the spatial-temporal scene of real world. This project is focusing on the dynamic visualization of geospatial data based on temporal-GIS, designing the interpreter arithmetic for geospatial polygon dynamic display, building dynamic display model based on temporal-GIS, subsequently, the model is used to analysis and solve the dynamic evolution characteristics of geographic phenomenon, reproduce the real-world temporal -spatial scenes, predict the developing trend of geo-data with the visualization methods.

Keywords: Temporal-GIS, Spatial-temporal Geo-data, Geospatial Polygon, Dynamic Display

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No. 148

The Impact of Climatic Changes on Permafrost Degradation in Source Region of the Yangtze River

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ABSTRACT

During the past fifty years, permafrost in source region of the Yangtze River (SRYR) has been degrading at a rapid rate due to the influence of increasing human activities and climatic changes. As we all know, the population density in SRYR is not more than one person per square kilometer, so impact of human activities on permafrost is far less than that of climatic changes. Increase of air temperature has resulted in an increase in ground temperature, deepening of permafrost table and shrinkage of permafrost area. In addition to air temperature, many other meteorological factors especially sunshine duration and annual snow cover also have a direct effect on permafrost temperature and can modify the effect of changes in air temperature. In this paper, we analyzed the status of permafrost degradation and the variations of air temperature, sunshine duration and snow cover, pointed out the relationship between permafrost degradation and climatic changes.

Keywords: Source region of the Yangtze River, permafrost, degradation, climatic changes

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No. 149

Design and Realization of Disaster Assessment Algorithm after Forest Fire

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ABSTRACT

Based on GIS technology, this paper mainly focuses on the application of disaster assessment algorithm after forest fire and studies on the design and realization of disaster assessment based on GIS. After forest fire through the analysis and processing of multi-sources and heterogeneous data, this paper integrates the foundation that the domestic and foreign scholars laid of the research on assessment for forest fire loss with the related knowledge of assessment, accounting and forest resources appraisal so as to study and approach the theory framework and assessment index of the research on assessment for forest fire loss. The technologies of extracting boundary, overlay analysis, and division processing of multi-sources spatial data are available to realize the application of the investigation method of the burnt forest area and the computation of the fire area. The assessment provides evidence for fire cleaning in burnt areas and new policy making on restoration in terms of the direct and the indirect economic loss and ecological and environmental damage caused by forest fire under the condition of different fire danger classes and different amounts of forest accumulation, thus makes forest resources protection operated in a faster, more efficient and more economical way. Finally, this paper takes Lin'an city of Zhejiang province as a test area to confirm the method mentioned in the paper in terms of key technologies.

Keywords: Disaster Assessment; Forest Fire; Spatial Analysis; GIS

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No. 150

Conceptual modeling of spatial data generalization in GIS

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ABSTRACT

Conceptual modeling is one of the most vital aspects of digital map generalization study, but at the same time it is probably the least understood. The relationship between spatial data generalization in GIS and map generalization is very close. However, distinctions exist at the same time. Based on analysis of massive references, the interrelationship of multi-scale, manual map generalization, digital map generalization, geographic database, cartographic database and conceptual modeling are discussed. This paper proposes and tests a simple conceptual modeling for spatial data generalization in GIS.

Keywords: GIS, spatial data generalization, map generalization, conceptual modeling

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No. 151

A Geospatial Collaboration Information System for City Environment Assessment Based on Adaptive Workflow

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ABSTRACT

City environment assessment based on cyber-infrastructure includes the activities of information exchange, information system collaboration and service integration among multiple departments. The method of adaptive service workflow (ASW) for geospatial collaborative system is proposed. With considering of the service quality and optimization algorithm, the virtual workflow (VW) and optimized selection of service (OSS) model are given for the selection of the best service in distributed computing environment. An application example of city environment assessment for poison gas diffusion is developed with the information collaboration between weather bureau, city construct department and environmental department, and the experiment result of diffusion plume is visualized and overlapped with base map on Web client.

Keywords: Geographic information Service, distributed computing, adaptive workflow, environment assessment.

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No. 152

GIS-based study on spatial growth of bi-polar with corridor in the Baltimore-Washington region in the USA

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ABSTRACT

The sprawl process in the metropolitan area of the Baltimore-Washington is a typical Bi-polar growing process among corridors. This paper studies the urbanization of Baltimore-Washington region within 200 years. By using the GIS software Mapinfo7.0, we gained the ratio changes of urbanized area to non-urbanized area and the radii of incircle and circumcircle of two regions. Then we took the former as integrated study and the latter as contrastive study. We find that the metropolitan growth has a 30-40-year cycle phenomenon. Both core growth and corridor growth form the urban expansion of Baltimore and Washington, but each of them has different rates and characteristics. This process can be described as "point-line-net-surface growth model". And the urban growth of Baltimore is better than Washington. Usually, traditional studies of spatial sprawls of Bi-polar of growth with Corridor Structures take the Bi-polar of growth with Corridor Structures as a whole to study the expanding process, while this paper tries to reveal the law of the spatial growth of Bi-polar of growth with Corridor Structures by contrasting the growths of cores 、the growths of corridors and the growths of core and corridor in two regions. Moreover, this study is built on the GIS platform and takes the GIS as a research base by using GIS software to access and processing of remote sensing data. At the same time, the paper uses the ecological processes model to carry out quantitative study to deepen its understanding on the Bi-polar growing with corridors structure, and this will conducive to scientific urban and regional planning.

Keywords: Metropolitan area, the growth of bi-polar with corridor structure, GIS, Logistic Model

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No. 154

A software tool for calculating the urban compactness from remote sensing classification image

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ABSTRACT

In this paper, two methods for calculating urban compactness are introduced: one of them is a pixel based method designed by the author before and the other one is the improving upon the compact ratio. These two methods were successfully programmed using C++ language and developed into a useful software tool which could calculate the urban compactness directly from remote sensing classification image, showing great convenience for the researchers of studying urban compactness. At last, the software tool was used for the change analysis of urban compactness in the cities of Dongguan and Foshan. The results showed that the increase of urban compactness in Dongguan city mainly occurred in the outside part. For the city of Foshan, compactness changes mainly occurred in the first to the third cirque area.

Keywords: Urban Compactness; Classification image; Software tool

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No. 155

Influence of different Spatial Sampling Schemes on Digital Elevation Models Interpolation

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ABSTRACT

It is known that digital elevation models (DEMs) can vary in quality depending on spatial sampling schemes. Three DEMs were created by Kriging interpolation from sampling points which come from different sampling schemes. Using a test setup, three different sampling schemes and different semivariogram models (Circular, Spherical, Tetraspherical, Pentaspherical, Exponential, Gaussian, Rational Quadratic, Hole Effect, K-bessel, J-bessel, and Stable) are compared. The results show uniform random sampling scheme to better than the other candidates.

Keywords: spatial sampling, DEM interpolation, universal Kriging, semivariogram

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No. 156

GIS-Based Climatic Regionalization of Potato Late Blight in Mountain Areas of Southwest Sichuan

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ABSTRACT

Tthrough the geographic insemination test in installments on five phases of potato late blight in four areas of Mianning and Zhaojue with the altitude of 1,600m, 1,800m, 2,100m and 2,500m respectively, this paper researches the meteorological causes, leading factors and climatic indexes for potato late blight in mountain areas of southwest Sichuan in detail. Based on that, short-term section climatic inspection data of mountain areas, observation data from meteorological post and latest data from automatic weather station are extensively collected, organized and processed by extension, based on which the Spatial Distribution Model of climatic indexes for potato late blight in mountain areas of southwest Sichuan is established in association with the routine surface observation data, $y=f(h,\varphi,l,\beta)$. With the geographic information data of 1:250000 and GIS technology, southwest Sichuan is divided into climatic liable region of potato blight, climatic secondary liable region and climatic non-liable region by factor setting and optimization method. Providing scientific basis for selection, distribution and prevention decision making for late blight resistant species of potato in southwest Sichuan, it has important value for production and application.

Keywords: potato late blight, climatic regionalization, mountain areas in Southwest Sichuan, GIS

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No. 157

Arable Land Spatial Pattern Analysis along the Middle-lower of Dongjiang River, China

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ABSTRACT

Regional land use change has been and will continue to be one of the hugest human impacts on the environment. Understanding the spatial configuration of urban areas will be important for quantifying dynamic change of land use. Arable land plays an important role in agricultural and economic development of China especially in Guangdong province. It is not only the basic material of crop production, but also the foundation and guarantee for implementing crop security. Based on the analysis of present situation of arable land, a land management policy for dynamic equilibrium of total arable land can be implemented. In order to understand the landscape pattern and the gradient characteristic of arable land along the middle-lower of Dongjiang River, we quantify the arable pattern with the combination of gradient analysis and landscape metrics. It is found that: (1) paddy land is the dominating land use type, the pattern of paddy land has strong effect on the whole landscape pattern, (2) The same metric value about different arable land use type has the obvious difference (3) Through out the gradient analysis, the metric chart of the arable land pattern has the inflexion near the borderline of the cities.

Keywords: Arable land, Landscape pattern, Gradient analysis, RS/GIS, Dongjiang River

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No. 160

Remote sensing -based study on the relationship between land brightness temperature and vegetation abundance in Wuhan city

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ABSTRACT

Vegetation abundance is an important indicator of urban heat island (UHI), because it influences the partitioning of sensible and latent heat fluxes. In order to reveal the effect of vegetation abundance on UHI of Wuhan city, one of the fast changing urban area in China, we classified land use/land cover types and calculated land brightness temperature (LBT) from a Landsat Enhanced Thematic Mapper Plus (ETM +) image acquired on July 9, 2002. The vegetation fraction derived from a linear spectral mixture analysis (LSMA) model was used as an alternative indicator of vegetation abundance. The fractal analysis of LBT and vegetation abundance was also conducted on 20 transects. Results showed that the spatial pattern of LBT changed with vegetation abundance and higher temperature was located in the area of lower vegetation abundance. Unmixed vegetation fraction was more negatively correlated with UHI than NDVI for most land cover types, except for water. Fractal analysis of image texture showed that transects comprised of larger number of different land cover types exhibited higher fractal dimension. On the contrary, the fractal dimension was lower in transects that covered mostly by built-up land. In addition, the fractal dimension correlation between LBT and vegetation abundance was higher than that between LBT and NDVI.

Keywords: land brightness temperature, vegetation abundance, urban heat island, spectral mixture model, fractal analysis

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No. 161

The study on landscape pattern change of wetland based on GIS and RS --An example of Dongting Lake area

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ABSTRACT

As one of three important ecosystems in the world ,wetland has complex , various and specific functions. With the change of its component ,the wetland ecosystem function is changing . Analyzing the process of wetland landscape change can expose the mechanism and rules of wetland landscape change and provide academic supply for sustainable use of wetland resource .In this paper the landscape pattern change of Dongting Lake wetland was studied. Dongting Lake wetland is one of the most important wetland ecosystems in China and it has complex and various functions and values.From 1980 to 2000,Dongting Lake wetland changed gradually due to natural factor and human activities.In order to better understand physical and human effect on wetland, protect and use the wetland resources sustainably in Dongting Lake area, it is necessary tor study the change of wetland landscape in Dongting Lake area .Some indices of the landscape pattern, such as landscape diversity index, landscape dominance index, landscape fractal dimension index are adopted .This study was on the basis of Chinese Academy of Sciences resource and environment spatial-temporal database and the two-stage remote sensing data: Landsat MSS data captured in 1980 and Landsat TM/ETM data captured in 2000. The result showed that wetland area increased by 16307hm^2, of which paddy field and riverwetland decreased largely, but pond wetland area increased obviously.Totally artificial wetland area increased, while natural wetland decreased. Accordingly the landscape pattern indices changed with the changes of area and perimeter of several wetland types in Dongting Lake. These changes are the result of interactions between human activities and natural factor.But the human impact on wetland is the most important causation in the past two decades. The changes of wetland landscape made environmental quality and ecological function decade in Dongting Lake area, especially the flood disaster aggravate.

Key words: Wetland; Dongting Lake area; Landscape change; RS

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No. 162

Land Use/Land Cover Change Geo-Informative Tupu of Nujiang River in Northwest Yunnan Province

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ABSTRACT

Land Use/Land Cover Change (LUCC) is the core components of global change researches. It is significant for understanding regional ecological environment and LUCC mechanism of large scale to develop the study of LUCC of regional level. Nujiang River is the upper reaches of a big river in the South Asia--Salween River. Nujiang River is a typical mountainous river which is 3200 kilometer long and its basin area is 32.5 ×105 square kilometer. It locates in the core of "Three Parallel Rivers" World Natural Heritage. It is one of international biodiversity conservation center of the world, the ecological fragile zone and key ecological construction area, as well as a remote undeveloped area with high diversity ethnic. With the rapidly development of society and economy, the land use and land cover changed in a great degree. The function of ecosystem has being degraded in some areas which will not only impact on the ecological construction of local area, but also on the ecological safety of lower reaches -- Salween River. Therefore it is necessary to carry out the research of LUCC of Nujiang River. Based on the theory and methods of geo-information Tupu, the "Spatial Pattern" and "Change Process" of land use of middle reach in Nujiang River from 1974 to 2004 had been studied in quantification and integration, so as to provide a case study in local area and mesoscale in time. Supported by the remote sensing and GIS technology, LUCC Tupu of 1974-2004 had been built and the characteristics of LUCC have been analyzed quantificationally. The results showed that the built-up land (Included in this category are cities, towns, villages, strip developments along highways, transportation, power, and communications facilities, and areas such as those occupied by mills, shopping centers, industrial and commercial complexes, and institutions that may, in some instances, be isolated from urban areas), agriculture land, shrubbery land, meadow & grassland, difficultly/unused land increased from 1974 to 2004, the increased area of shrubbery land was the greatest, while the area of forest, artificial forest, waters, glacier and snow covered land decreased. The biggest decreased area was forest land. The biggest LUCC was the transformation from forest

land to shrubbery land, the transformation from forest land to rangeland and agriculture land was the second. The main area of LUCC located at Nujiang River valley, between 2200-3700m of the east slope in the Gaoligong Mountain and 2800-3900m of the west slope of the Biluo Snow Mountain. From the valley to peak of mountain, the main land use type was transited from built-up land, agricultures land, artificial forest land to natural forest, shrubbery and grass land. The natural forest was the main land in the past 30 years. The main driving forces were the increase of population of local area, the governmental policies (Conversion of Farmland to Forests and Grass Land Projects, etc.) and urbanization. In order to accelerate the sustainable development of society economy and the ecological environment protection in this ecological fragile zone, strict management should be adopted to adjust the behaviors of human beings. Finally, VCM (variable clumping method) curve had been used to analyses the internal spatial distribution difference of land-use/land cover which shown that the landscape fragmentation was increased, the number of patches was added, the distance between patches was diminished during the past thirty years (1974-2004).

Keywords: Geo-informatics Tupu; Remote Sensing; GIS; Land Use/Land Cover Change

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No. 163

The abstraction method research of river network based on catchments' characters deriving digital elevation data

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ABSTRACT

The extraction of drainage networks and catchment boundaries from digital elevation models (DEMs) has received considerable attention in recent years and is recognized as a viable alternative to traditional surveys and the manual evaluation of topographic maps. Digital data on the position and characteristics of river networks and catchments are important for the analysis of water resources. GIS tools allow for the combined analysis of digital elevation data and environmental parameters in order to derive this kind of information. In this paper we present an application that selecting river network deriving digital elevation data. In this application, we use catchments as the unit of river abstraction. Many researchers took catchments as the base of hydrographic model because the catchments deriving from digital elevation data can reflect the characteristics of terrain which is the foundation of the river network. In the abstraction of river network, how to keep the structure of the river network after abstraction is the very important issue. This is why we choose the catchments deriving from digital elevation models as the unit of our generalization research. Considering the complication of the structure of river network, in this paper, we only choose three drainage patterns which are dendritic drainage patterns、featherlike drainage patterns、and Parallel drainage patterns as the examples of the research. From the results of research, it can not only keep the density of the river network, but also keep the structure of the river network.

Keywords: abstraction, generalization, drainage pattern, drainage density, drainage length, river network

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No. 164

Mapping Oriented Geometric Quality Assessment for Remote Sensing Image Compression

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ABSTRACT

In satellite mapping application area, geometric quality assessment for remote sensing image compression is of great importance for onboard compression index determination. The paper proposed an integral geometric quality assessment plan for remote sensing image compression, which includes image matching accuracy assessment, effects of compression on automated DSM/DEM extraction, and photogrammetic point determination accuracy assessment. Image matching accuracy analysis shows how degradation in image quality associated with lossy compression can affect matching accuracy. In analyzing effects of compression on automated DSM/DEM extraction, a DSM is extracted from the original stereopair and held as the reference against which the terrain heights obtained from compressed imagery are compared. Similar to DSM extraction accuracy analysis, photogrammetric point determination accuracy analysis is proposed to compare the accuracy of two sets of 3D coordinates of the feature points which are from original images and reconstructed images. The relationship between compression ratio and terrain types was examined. As to SPIHT algorithm adopted in Resources Satellite-3, the experiment results showed that the compression ratio should be no more than 4:1for mapping application.

Keywords: remote sensing image compression, geometric quality assessment, SPIHT

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No. 165

Virtual Global – A new visualization system for virtual geographic environment

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ABSTRACT

Virtual Global, a new visualization system is designed and developed by Key Laboratory of Virtual Geographic Environment (Nanjing Normal University) as the visualization platform of the virtual geographic environment. In order to represent various types of data about geographic information, 3D scene, geographic models and geographic phenomena simulation in the world wide, Virtual Global is designed in which terrain, imagery data, various types of 3D models and annotation can be represented. Distributed data service and the transfers of compressed data on the internet are supported, too. The high speed transmission of imagery data, large scale terrain real-time roaming, automatic annotation placement and so forth are also implemented. The spatial scattered grid which can satisfy the modeling and simulating of the geography effectively is integrated into this system. Distributed data management is used and massive data is stored on different computer. Progressive data transmission is introduced and data is downloaded according to the requirement of the client. The frequency of access to the internet is reduced.

Keywords: Virtual Global, Virtual Geographic Environment, Vector Data, Spatial Analysi

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No. 166

Application of Mobile GIS in Special Equipment Inspection-Based on PDA

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ABSTRACT

This paper discusses how to apply the mobile GIS technology to the common special equipment inspection business to meet the requirements of efficient management. The concepts of "special equipment" and "mobile GIS" are introduced at beginning. Then we analyze the business background and the present technique research; put forward a mobile GIS solution apply to special equipment inspection. A Special Equipment Inspection System is designed independently. The system architecture and database structure are discussed in detail. In the mobile environment, three key technologies are especially discussed in the paper, such as the interface design adapt to PDA device, data alternate mechanism and other embedded development attentions. The system has been used in Hangzhou Bureau of Quality and Technical Supervision for special equipment management, and gotten good result. So the requirements of scientifically manage the special equipment and establish e-government are completed met.

Keywords: Mobile GIS, PDA, Special Equipment, Inspection

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No. 167

A Highly Scalable Urban Planning Management Information System-Case Study: Suzhou Urban Planning Bureau

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ABSTRACT

During the urbanization process, when facing complex requirements of city development, ever-growing urban data, rapid development of planning business and increasing planning complexity, a scalable, extensible urban planning management information system is needed urgently. PM2006 is such a system that can deal with these problems. In response to the status and problems in urban planning, the scalability and extensibility of PM2006 are introduced which can be seen as business-oriented workflow extensibility, scalability of DLL-based architecture, flexibility on platforms of GIS and database, scalability of data updating and maintenance and so on. It is verified that PM2006 system has good extensibility and scalability which can meet the requirements of all levels of administrative divisions and can adapt to ever-growing changes in urban planning business. At the end of this paper, the application of PM2006 in Urban Planning Bureau of Suzhou city is described.

Keywords: Customizable systems, DLLs, expansibility, Scalability, Virtual Database Group, Workflow

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No. 168

DOM database based on ArcSDE

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ABSTRACT

To solve the problems of massive, multi-source provincial image data management, storage, retrieval, and so on, ArcSDE spatial data engine architecture and data model are used to establish a provincial DOM database by combining Oracle 10g database management system. The establishment of the database of remote sensing images successfully solve some specific problems of the block image data processing, image pyramid building, data compression, etc. Meanwhile, the grid index structure and the method of retrieval based on contents are adopted. It has been proved by practice that the disposal of the images by level and block can store the images in a fast and efficient way. The combination of grid index accelerates the retrieval of the images, and the DOM data can be effectively organized, security storage and effectively used.

Keywords: DOM, spatial data engine, image pyramid, grid index

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No. 169

Study on the Spatial Distribution of Comfortable Climate for Tourism in Chongqing Based on GIS

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ABSTRACT

This article calculated the distribution of the index temperature-humidity and wind effect in Chongqing based on the spatial distribution of temperature, sunshine duration, wind speed, and relative humidity, which considering the influence of terrain. With the guide line of W. H. Terjung Method, we categorized the distribution of comfortable climate for tourism in Chongqing. The results showed that the distribution of comfortable climate for tourism in Chongqing basically consistent with the actual situation, and has the typical of regional and seasonal characters, Comparing to spatial interpolation methods of the past which do not consider the role of terrain effects. It is a useful experiment in the study of the comfortable climate for tourism over the rugged areas.

Keywords: Chongqing, GIS, temperature-humidity index, wind effect index, comfortable climate for Tourism, W. H. Terjung Method

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No. 170

On Semantics-Based Spatial Data Preprocessing: A Case Study in Non-Ortho RS Images Mosaic

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ABSTRACT

A Three-Level Information Architecture containing Syntactic Information, Semantic Information and Pragmatic Information is put forward in Comprehensive Information Theory (CIT). From this point of view, spatial data analysis is in cooperation with semantic information and Spatial Data Preprocessing (SDP) is corresponding to syntactic information. However, in many practical applications, SDP based only on syntactic information can not get a good effect. Semantics-based preprocessing may be an effective scheme. RS images mosaic is a typical SDP where optimal mosaic line extraction is the crux. Lots of researches based on syntactic information are effective just for orthophoto maps. In this paper, an overall optimal mosaic line extraction scheme has been addressed for non-Ortho RS images. It is argued that there is no projection error in the projection datum fitted by Ground Control Points (GCPs), or regional main height surface which can be recognized in medium resolution RS images. Based on above reasons, the method suggests that GCPs collecting for precise geometrical correction should be on the main height surface, as well as the mosaic line extracting for RS images mosaic. Three sheets of CBERS CCD images of Taiyuan are taken as the experimental data. According to the afore-mentioned method, by collecting GCPs in wide riverbeds, all three sheets are rectified to an existing ETM+ mosaic image. And then, the central lines of wide riverbeds in the overlapping areas are extracted as the mosaic line. The experimental result indicates that this method can extract an overall optimal mosaic line and eliminate the visual texture seam-line effectively, even for non-Ortho RS images. It concludes that SDP based on semantic information can play a good role in spatial data applications.

Keywords: Semantic Information, Comprehensive Information Theory (CIT), Spatial Data Preprocessing (SDP), Overall Optimal Mosaic Line, Main Height Surface

Sun Yat-sen University - University of Cincinnati
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No. 171

Dynamic simulation of ground deformation based on animation

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ABSTRACT

Ground deformation caused by groundwater exploitation, mine exploitation, deep foundation pit excavation, etc, seriously threatens normal production and life and structure safety of buildings, and the capacity of soil cultivation descends or abandons, so it is significance that studying defending and controlling methods of ground surface deformation. Because of the difficulty of reality expressing spatio-temporal characteristic and information of ground surface deformation, in order to solving the problem, it is need to adopt combining methods both spatial information technology and animation technology, and discusses the contents and ways of ground surface deformation dynamic simulation. Firstly, by means of ground surface deformation spatio-temporal course, the ground surface deformation spatio-temporal is founded. Secondly, on the basis of analyzing the time effect and space distribution characteristics of ground surface deformation caused by groundwater exploitation, mine exploitation, deep foundation pit excavation, the contents and ways of ground surface deformation dynamic simulation is founded. Finally, spatio-temporal characteristic of ground surface deformation is simulated by animation technology, digital terrain model and spatio-temporal database. The research shows that the dynamic simulation can nicely reflect spatio-temporal characteristics of ground surface deformation, and can expediently and rapidly study the laws of ground surface deformation.

Keywords: animation, ground deformation, dynamic simulation

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No. 172

A Reusability and Efficiency Oriented Software Design Method for Mobile Land-Inspection

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ABSTRACT

Aiming at the requirement from the real-time land inspection domain, a land inspection handset system was presented in this paper. In order to increase the reusability of the system, a design pattern based framework was presented. Encapsulation for command like actions by applying COMMAND pattern was proposed for the problem of complex UI interactions. Integrating several GPS-log parsing engines into a general parsing framework was archived by introducing STRATEGY pattern. A network transmission module based network middleware was constructed. For mitigating the high coupling of complex network communication programs, FACTORY pattern was applied to facilitate the decoupling. Moreover, in order to efficiently manipulate huge GIS datasets, a VISITOR pattern and Quad-tree based multi-scale representation method was presented. It had been proved practically that these design patterns reduced the coupling between the subsystems, and improved the expansibility.

Keywords: Land inspection, design pattern, mobile GIS, Reactor, multi-scale representation

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No. 173

Monitoring Wetland of Poyang lake National Nature Reserve zone by Remote Sensing

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ABSTRACT

In order to monitor the wetland of the Poyang Lake national nature reserve zone, we selected three different seasons TM image data which were achieved individually in April 23th in 1988, Nov 2nd in 1994, and Jan 1st in 2000. Based on the band 5, band 4 and band 3of TM image, we divided the land coverage of Poyang Lake national nature reserve zone into three classes--water field, meadow field and the other land use by rule of maximum likelihood. Using the outcome data to make the statistical analysis, combining with the GIS overlay function operation, the land coverage changes of the Poyang Lake national nature reserve zone can be achieved. Clipped by the Poyang Lake national nature reserve zone boundary, the land coverage changes of Poyang Lake national nature reserve zone in three different years can be attained. Compared with the different wetland coverage data in year of 1988, 1994, 2000, the Poyang Lake national nature reserve zone eco-environment can be inferred from it. After analyzing the land coverage changes data, we draw the conclusion that the effort of Poyang Lake national nature reserve administration bureaucracy has worked well in certain sense.

Keywords: Poyang Lake; TM image; land cover; wetland

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No. 174

The regional geological hazard forecast based on rainfall and WebGIS in Hubei, China

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ABSTRACT

Various disasters have been a serious threat to human and are increasing over time. The reduction and prevention of hazard is the largest problem faced by local governments. The study of disasters has drawn more and more attention mainly due to increasing awareness of the socio-economic impact of disasters. Hubei province, one of the highest economic developing provinces in China, suffered big economic losses from geo-hazards in recent years due to frequent geo-hazard events with the estimated damage of approximately 3000 million RMB. It is therefore important to establish an efficient way to mitigate potential damage and reduce losses of property and life derived from disasters. This paper presents the procedure of setting up a regional geological hazard forecast and information releasing system of Hubei province with the combination of advanced techniques such as World Wide Web (WWW), database online and ASP based on WEBGIS platform (MAPGIS-IMS) and rainfall information. A Web-based interface was developed using a three-tiered architecture based on client-server technology in this system. The study focused on the upload of the rainfall data, the definition of rainfall threshold values, the creation of geological disaster warning map and the forecast of geo-hazard relating to the rainfall. Its purposes are to contribute to the management of mass individual and regional geological disaster spatial data, help to forecast the conditional probabilities of occurrence of various disasters that might be posed by the rainfall, and release forecasting information of Hubei province timely via the internet throughout all levels of government, the private and nonprofit sectors, and the academic community. This system has worked efficiently and stably in the internet environment which is strongly connected with meteorological observatory. Environment Station of Hubei Province are making increased use of our Web-tool to assist in the decision-making process to analyze geo-hazard in Hubei Province. It would be more helpful to present the geo-hazard information for Hubei administrator.

Keywords: WEBGIS, MAPGIS-IMS, Rainfall, geological disaster, forecast

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No. 176

Archaeology Management System based on EV-Globe

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ABSTRACT

Traditionally, cultural relics were recorded in a 2D (2 dimensions) method such as paper maps, pictures, multi-media, micro-models and so on. This paper introduces the archaeology management system based on EV-Globe (Earth View-Globe——spatial information service platform on virtual 3D environment) for the cultural relics along the Eastern Route Project (ERP) of South-to-North Water Diversion (SNWD). Integrate the spatial and attribute data of the cultural relics along ERP of SNWD processed by SuperMap deskpro2005 with the relative basic geological data based on the platform of EV-Globe and develop a series of functions based on the SDK (Software Development Kit), and so the relics can be managed visually, at the same time the system may assist the archaeologists and some researchers in managing and studying the cultural relics. Some conception and conceiving of web and mobile version is put forward for next researching.

Keywords: EV-Globe; South-to-North Water Diversion; Cultural Relics; Management System

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No. 177

Snow mapping using MODIS satellite data in Northern Xinjiang Basin, China

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ABSTRACT

Snow is the most important freshwater resource in Northern Xinjiang Basin, which is a typical inland arid ecosystem in western China. Snow mapping can provide useful information for water resource management in this arid ecosystem. An applicable approach for snow mapping in Northern Xinjiang Basin using MODIS data was proposed in this paper. Linear spectral mixture analysis was used to calculate snow cover fractions within a pixel, which was used to establish a regression function with NDSI at a 250-meter grid resolution. Field campaigns were conducted to examine whether NDSI can be used to extend the utility of the snow map approach to obtain sub-pixel estimates of snow cover. In addition, snow depths at 80 sampling sites were collected in the study region. The correlation between image reflectivity and snow depth as well as the comparison between measuring snow spectra and image spectra were analyzed. An algorithm was developed on the basis of the correlation for snow depth mapping in the region. Validation for another dataset with 50 sampling sites showed an RMSE of 1.63, indicating that the algorithm was able to provide an estimation of snow depth at an accuracy of 1.63cm. The results indicated that snow cover area can reach 81% and average snow depth was 13.8 cm in north Xinjiang in Jan 2005. Generally speaking, the snow cover and depth had a trend of gradually decreasing from north to south and from the surroundings to the center. Temporally, the cover reached a maximum in early January, and the depth reached a maximum was ten days later. Snow duration was so different in different regions with the Aletai region having the longest and the Bole having the shortest. In the period of snow melting, snow depth decreased earlier, afterward snow cover dwindled. Our study showed that the spatial and temporal variation of snow cover was very critical for water resource management in the arid inland region and MODIS satellite data provide an alternative for snow mapping through dedicated development of mapping algorithms suitable for local application.

Keywords: snow mapping, Northern Xinjiang, MODIS satellite data, snow cover, snow fraction, snow depth.

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No. 178

A Knowledge-based Agent Prototype for Chinese Address Geocoding

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ABSTRACT

Chinese address geocoding is a difficult problem to deal with due to intrinsic complexities in Chinese address systems and a lack of standards in address assignments and usages. In order to improve existing address geocoding algorithm, a spatial knowledge-based agent prototype aimed at validating address geocoding results is built to determine the spatial accuracies as well as matching confidence. A portion of human's knowledge of judging the spatial closeness of two addresses is represented via first order logic and the corresponding algorithms are implemented with the Prolog language. Preliminary tests conducted using addresses matching result in Beijing area showed that the prototype can successfully assess the spatial closeness between the matching address and the query address with 97% accuracy.

Keywords: Address Geocoding, Address Validation, Knowledge Based Agent, Spatial Ontology, Inference Rules

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No. 179

Development of Management Information SystemFor Land in Mine Area Based on MapInfo

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ABSTRACT

MapInfo is current a popular GIS software. This paper introduces characters of MapInfo and GIS second development methods offered by MapInfo, which include three ones based on MapBasic, OLE automation, and MapX control usage respectively. Taking development of land management information system in mine area for example, in the paper, the method of developing GIS applications based on MapX has been discussed, as well as development of land management information system in mine area has been introduced in detail, including development environment, overall design, design and realization of every function module, and simple application of system, etc. The system uses MapX 5.0 and Visual Basic 6.0 as development platform, takes SQL Server 2005 as back-end database, and adopts Matlab 6.5 to calculate number in back-end. On the basis of integrated design, the system develops eight modules including start-up, layer control, spatial query, spatial analysis, data editing, application model, document management, results output. The system can be used in mine area for cadastral management, land use structure optimization, land reclamation, land evaluation, analysis and forecasting for land in mine area and environmental disruption, thematic mapping, and so on.

Keywords: GIS, MapInfo, MapX, Development, Land in mine area

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No. 181

Ontology and rules based model for traffic query

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ABSTRACT

This paper will combine ontology and rule based qualitative reason with real time calculation, designing a combined traffic model of national scope which contains highway, railroad, water carriage, scheduled flight etc. That method follows the sense of people to space, establishes ontologies and rules knowledge base, using concepts, instances, relations and rules of traffic field as the basic knowledge for qualitative reason to discover implicit semantic information and eliminate unnecessary ambiguities. The knowledge from the ontologies and rules provides abundant information for query which can lighten the burden of computation, in the mean time, real-time calculation guarantees the accuracy of the data, has raised accuracy and efficiency of the query, which has strengthened the ease of query service and improved web users' experience.

Keywords: ontology, rules, qualitative reason, combined traffic

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No. 182

Effects of land use change on ecosystem services value — A case study in the western of Jilin Province

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ABSTRACT

Using RS and GIS, based on the data of Landsat TM/ETM+, the paper analyzes land use/cover change and calculates their effects on ecosystem services value in the western of Jilin province from 1993 to 2003.The methods are based on ESV computing formula and ESV coefficients. The following results and conclusions could be obtained①:From1993 to 2003,the area of rice paddy, woodland ,unutilized and build-up land increased, among which the area of rice paddy increased most greatly and increased by 48782.72hm^2, while grassland, wetland ,water area ,dry farmland decreased, among which the area of dry farmland decreased most greatly and decreased by 34354.72hm^2; ②The total value of ecosystem services of the study area declined from ¥988.45×10^8 in 1993 to ¥ 921.12×10^8 in 2003,with the net decline of ¥67.33×10^8 during the 10-year time period; ③The contribution of various ecosystem functions to the overall value of the ecosystem services mainly comes from the increase in gas regulation, soil formation and disposition, food production and raw materials, while climate regulation, water conservation, recreation, waste treatment and bio-diversity conservation had a decreased effect. Raw materials increased most greatly and increased by 5.91%, while water conservation decreased most greatly and decreased by 9.60%.④The sensitivity analysis suggested that these estimates are relatively robust.

Keywords: land use/land cover change (LUCC), ecosystem services value (ESV),coefficient of sensitivity (CS), the western of Jilin Province.

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No. 183

Urban Expansion Analysis Based on Spatial Variables Derived from multi-temporal remote sensing imagery

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ABSTRACT

In this research, we focus on the spatial pattern of the urban expansion. The spatial pattern of the urban area can be quantitatively delineated by many spatial variables. Numerous spatial variables have been examined to evaluate their applicability to the urban change. These metrics include road network accessibility, built-up density and some landscape metrics. Remote sensing technology was used for monitoring dynamic urban change. Multi-temporal Landsat TM images (1988, 1991, 1994, 1997, 2000, and 2002) were used for the change detection using post-classification comparison method. The road network and its change were extracted from multitemporal images using the GDPA algorithm. Contagion, one of the landscape metrics, was selected, because it it can describe the heterogeneity of the suburban area, where the landuse change is most likely to happen. Analysis has also been conducted to identify the relationship between urban change and these spatial variables.

Keywords: Remote sensing, urban expansion, landscape metrics, contagion, GDPA algorithm, Road network density

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No. 185

The Research of Spatial Information Communication and Cognition Theory in LBS System

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ABSTRACT

With the rapid development of LBS system in recent years, the existed communication and cognition model cannot describe its features entirely. After the analysis of the features of the LBS system, aiming at the limitations of existed communication and cognition theory, this paper proposes the spatial information communication model in LBS system and the cognition model of LBS subscribers.

Keywords: LBS, Communication Model, Cognition Model

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No. 186

Distributed WebGIS model based on server farm

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ABSTRACT

The deficiencies of traditional WebGIS model were analyzed. From the points of load-balancing and map status synchronization, we proposed a new distributed model based on server farm. It used user-defined bottom interactive protocol, distributed dynamic balancing scheduling algorithm and map status object pool to solve many problems in the traditional model such as inefficient heterogeneous compatibility, weak parallel processing capability, and the difficulties in map status synchronization. A test-bed was established to verify the performance of the model. A series of test results has proved that the new WebGIS model has strong heterogeneous compatibility, parallel processing capability and fault-tolerant features. Through the mechanism of map status synchronization, the new model can realize sustained preservation and synchronization of map operated statuses and meets the demands of users' uninterrupted accesses.

Keywords: WebGIS, distributed, server farm, load-balancing, heterogeneous compatibility, parallel processing capability, map status synchronization

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No. 187

DSM generation from multiple digital aerial images in urban area

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ABSTRACT

In this paper, we present a matching method for DSM generation from multiple images based on feature points, which introduce the coarse-to-fine strategy, geometrically constrained matching and relaxation technology, the matching is guided by the information in the object and make full use of the information in both image and object space. A match appearing in any pair has the chance to survive, and very dense disparity maps are obtained. Experiments have been performed and the height accuracy of the derived DSM is about 3 pixels.

Keywords: DSM, multiple image matching, urban, digital aerial images, dense, reliable

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No. 188

A Model of Spatial Data Interoperability on Oracle Spatial

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ABSTRACT

It has been acclaimed that the future vision for GIS data sharing might look like this: each of small counties or towns hosts its own online GIS; and each uses software and a data model selected to best meet its own needs. This paper gives a model based on Oracle Spatial, within a local government or enterprise the spatial data is in centralized storage, and with metadata interoperability, which enables the organizations to use the proper tool for the job while eliminating complicated data transfers and duplications throughout the enterprise or different departments. The MapInfo and ArcGIS software have been made to work together under the same oracle spatial database use trigger and storage process. On another hand, with the situation of between the departments or enterprises, a three-tier structure solution is given: spatial data server, application server and application client. The application server is a mediation system, this model uses oracle application server as the mediation system, and through the application server the application client sends WMS or WFS request and get the map server for background application. The three-tier structure model exposes a GIS portal which is an online GIS for external applications. Any client can request the server if it accords with WMS or WFS specification.

Keywords: interoperability, integration interoperability, WMS, WFS, Oracle Spatial

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No. 190

Parametric Design Method for Geospatial Data Visualization and Interactive Map Modeling

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ABSTRACT

Traditional environment of spatial data visualization and map design was oriented to idiographic geometric shapes and users were over limited to some details. Its disadvantages mainly are: (1) visualization model is not flexible and fully user-oriented; (2) the whole process of visualization scheme cannot be supported; (3) system cannot support rapid modification and effectively reuse of former results. The theory and method of Parametric Design was proposed in this paper to get a new solution. System constraint model of geosciences maps was set up, and the constraints were classified into four main types which are geometric constraint, structure topological constraint, standard constraint and attribute constraint. Based on the synthetic analysis and comparison of various constraint solving algorithms, the geometric constraint solving method based on graphics theory was introduced. And the system structure of parametric design system with one platform and five layers, and relative system function model were put forward. Case studies of some typical graphics designs were discussed. The result indicates that parametric design method can play an important role in representation of user's idea, interactive design of map structure and building the flexible graphics generation environment.

Keywords: spatial data visualization, map modeling, constraint model, parametric design, constraint solving

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No. 191

An application of GIS and Bayesian Network in Studying Spatial Causal Relations between Enterprises and Environmental Factors

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ABSTRACT

The paper intends to employ Geographic Information System (GIS) and Bayesian Network to discover the spatial causality between enterprises and environmental factors in Beijing Metropolis. The census data of Beijing was spatialized by means of GIS in the beginning, and then the training data was made using density mapping technique. Base on the training data, the structure of a Bayesian Network was learnt with the help of Maximum Weight Spanning Tree. Eight direct relations were discussed in the end, of which, the most exciting discovery, "Enterprise-Run Society", as the symbol of the former planned economy, was emphasized in the spatial relations between heavy industry and schools. Though the final result is not so creative in economic perspective, it is of significance in technique view due to all discoveries were drawn from data, therefore leading to the realization of the importance of GIS and data mining to economic geography research.

Keywords: location, enterprise, GIS, Bayesian network, economic geography, direct relationship, causality, data mining

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No. 192

A robust registration method for high resolution remote sensing images

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ABSTRACT

In this paper, we propose an automatic and accurate image registration method for the high resolution. Due to the strong distortion caused by the terrain relief in this kind of images, it cannot be resolved by one set of transformation coefficients for the whole image. So the method mainly consists of two parts: one part is the dense feature point matching, and the other is the faced based differential registration. The matching algorithm integrates the feature point matching, relaxation optimization technique, the Least Square Matching, the coarse-to-fine strategy, and it can provide hundreds of thousands of reliable and accurate control points. With the TIN, these points divide the image into a lot of small triangles. For each triangle, we can assume the local distortion is simple and can be depicted by the affine transformation function. Finally, faced based differential registration is performed to resample the slave image. Experiments have been carried out and satisfactory results have been obtained.

Keywords: image registration, feature point matching, relaxation optimization, TIN, faced based differential registration, reliable, accurate

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No. 193

Estimation of the spring wheat water and chlorophyll content in Rainfed Agriculture Areas of Loess Plateau based on the spectral absorption feature of the liquid water and chlorophyll

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ABSTRACT

Because of the high water content of vegetation, water absorption feature dominate spectral reflectance of vegetation in the near-infrared region of the spectrum, and chlorophyll dominate the visible region . Previous studies have primarily related water band indices (WI) to vegetation water content .But the similar studies are vacancy in Rained Agriculture Areas of Loess. Two observation tests were carried out in arid and semi-arid area in Loess Plateau in order to find out the best preferential sensitively spectral index to water content and chlorophyll for the spring wheat and to monitor crops drought in this area. The results indicated that at leaf level the NDVI and EVI are the highest sensitive indices to the FMC and Chlorophyll, and for the leaf EWT,SAVI is the best index((r=0.738,P<0.01)); at canopy level, the red edge (λ_{red}) and the water content have the best relationship, and the sensitivity for WI_{1180} and NDWI are better . And the λ_{red} is also the best indictor for the chlorophyll at canopy level, the second is R670/R440, Furthmore, If considered the potential for atmospheric interference when data are collected from aircraft or satellite plarforms, So WI_{1180} ,WI_{1450} and NDWI may be the feasible for satellite remote sensing of vegetation water content at the canopy level. Meanwhile the NDVI and EVI may be the best index for satellite remote sensing of vegetation water content at leaf level for the arid and semiarid Rainfed Agriculture Areas of Loess Plateau.

Keywords: spring wheat, hyperspectral index, water content, chlorophyll

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No. 194

The analysis of water network of Beijing-Tianjin region based on the complex network theory

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ABSTRACT

This paper aims to study the characteristics and spatial distribution of water network in Beijing-Tianjin region of China based on the complex network theory. Through construction of the weighted degree distribution model and clustering coefficient model, it is found that the network of natural rivers and the artificial channel are different network systems. The former tends to be a Scale-Free network which has power-law degree distribution with a bigger clustering coefficient, while the latter owns Random network features which has Poisson-oriented degree distribution with a smaller clustering coefficient. As the major role of natural river network, the water network of Beijing-Tianjin region tends to be a Scale-free network, which means that there must be a few significant nodes and areas that dominate the ecological and economic security of the whole region. Hence this paper also interpolates the degree of nodes by using the Kriging Interpolation function of ArcGIS9.0, and then the spatial distribution map of the nodes of water network in Beijing-Tianjin region was gained, showing that the significant nodes of water network mainly locate in Southeast area of Tianjin region and Northeast area of Beijing region.

Keywords: water networks, urban ecological security, scale-free network, random networks, ArcGIS9.0, Beijing-Tianjin region

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No. 195

Digital Forest implementation Based on Integration of GPS, GIS and RS

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ABSTRACT

Forest plays an important part in the sustainable development. Digital forest implementation will be helpful in cognizing and managing the forest. The paper discusses the programming theory of digital forest construction, and constructs the basic framework of digital forest using a series of modern information technologies, including integration of GPS, GIS and RS, software development and computer network. Taking monitoring of forestry biological pest as a thematic application case and adopting a series of successfully developed systems, this paper validates that it is feasible to implement digital forest with this method.

Key words: digital forest, 3S integration, embedded GIS, WebGIS

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No. 196

Query evaluation on efficiently encoded GML streams

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ABSTRACT

We consider the growing need for querying GML stream and the bulkiness of textual GML. To get things better, we firstly analyze the applicability of Efficient XML Interchange (EXI) encoding for GML and propose EXI encoded GML. Then we develop the SITPath query language supporting geospatial data types and some rich characteristics inherited from XPath within the constraints of streaming limitation. We subsequently present the streaming query evaluation algorithm and some main parts of EGQ engine that evaluates SITPath queries on EXI encoded GML without decoding in advance. Finally, the experimental results indicate the practical time and space performance advantages of EGQ brought about by the query evaluation algorithm and EXI encoding.

Keywords: GML, EXI, SITPath, EGQ, streams, query evaluation

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No. 197

Multi-agent simulation of the von Thünen model formation mechanism

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ABSTRACT

This research tries to explain the internal driving forces of circular structure formation in urban geography via the simulation of interaction between individual behavior and market. On the premise of single city center, unchanged scale merit and complete competition, enterprise migration theory as well, an R-D algorithm, that has agents searched the best behavior rules in some given locations, is introduced with agent-based modeling technique. The experiment conducts a simulation on Swarm platform, whose result reflects and replays the formation process of Von Thünen circular structure. Introducing and considering some heterogeneous factors, such as traffic roads, the research verifies several landuse models and discusses the self-adjustment function of price mechanism.

Keywords: multi-agent simulation, Thünen model, reproduction, diffusion

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No. 198-1

Spatial assessment of the change of mountain range farmland use based on RS and GIS

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ABSTRACT

Assessment of the change of farmland use is of great important. After comparing the different ways of the assessment of farmland use change, a spatial assessment of the change of mountain range farmland use based on RS and GIS technology was presented. Such spatial assessment way has the virtue of quantified and visual characters. It use the land change information fast gained ability of RS, the formidable spatial data processing and the analysis ability which GIS provides, and integrating the statistical analysis software package. After the analysis to the primary factors reflects the farmland use, a spatiotemporal change model of had been put forward to assess the farmland use change. A comprehensive factor for sustainable development model (CISD) is made to reflect the region development situation. Finally, based on the mountain range farmland use change spatial assessment method mentioned above, the change of mountain range farmland use of Shaoguan city in Guangdong province (China)was studied, and a good effect was obtained. Such application proves the validity and feasibility of the spatial assessment method of the change of mountain range farmland use mentioned in this paper.

Keywords: Spatial Assessment, Farmland Use, RS, GIS

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No. 198-2

Study on inversion model for the suspended sediment concentration in The Pear River delta using remote sensing technology

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ABSTRACT

On the basis of quantitative remote sensing theories, we measured the water samples of Pear River in the same zone during the flood season and the dry season synchronously by spectrum instrument and traditional way, and made sure the correlation of the data simultaneously, then worked out the remote sensing reflectance for TM imagery relevant to the spectrum instrument. The suspended sediment concentration was determined by hydrologic observation site. Eight kinds of experiment models are derived from the correlation of the reflectance and the concentration .It is concluded that the spectrum of TM3 measured during flood season correlates best with suspended sediment concentration; And the ratio of TM3 to TM2 has the best correlation with the concentration beyond the flood season. Based on the results, the results of models correspondingly with each season are better.

Keywords: Pear River; reflectance; suspended sediment concentration; TM; inversion model

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No. 200

Image mosaicking from aerial unmanned airplane

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ABSTRACT

In this article, the SIFT method is employed to combine a lot of images together from aerial unmanned airplane, without any control points. And the image number of this method is smaller than that of the triangulation. SIFT feature, which has shown great success in computer vision, is introduced into image registration in remote sensing. We extract distinctive invariant features from images that can be used to perform reliable matching between different views of an object or scene. The features are invariant to image scale and rotation, they are well localized in both the spatial and frequency domains, reducing the probability of disruption by occlusion, clutter, or noise.

Keywords: mosaicking, SIFT, unmanned-aerial airplane, triangulation

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No. 201

Geostatistical analysis of the horizontal distribution of soil lead Guangdong, China

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ABSTRACT

The spatial distributions of soil lead concentration in three horizontal soils in Guangdong, China, were surveyed and analyzed using geostatisitic and GIS. A total of 260 soil profiles data followed an approximately lognormal distribution. The Pb geometric mean concentration of 23.3 mg/kg in surface soils is higher than that in global soils. From A- to C-horizon Pb geometric mean concentrations had an increasing tendency of 23.3, 27.2 to 28.6 mg/kg. The ordinary point kriging estimates of Pb concentration were mapped. It showed higher local concentration around big city and historical mining area. The soil lead distribution was mainly dependent on bedrock properties. The anthropogenic impact is distinguished in local areas such as some big cities and mine areas, where the lead concentration is higher than their guide value. The results showed a strong gradient of anthropogenic stock of Pb around the Guangzhou urban area.

Keywords: Lead, Pb, Pb distribution, Heavy metal

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No. 202

An Automatic Rapid Annotation Placement Algorithm of Point Features Based on Template

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ABSTRACT

This paper first discusses the necessity of the automatic annotation placement. According to the Chinese custom of reading map, based on the present principle of map annotation placement, a new principle is proposed. Then some present algorithms of automatic map annotation placement are introduced and, at the same time, their shortcomings are pointed out. In order to improve the automatic annotation placement, the authors bring forward an automatic annotation placement algorithm of point feature based on template. The template is explained and described by figures. Then the automatic placement process using the template algorithm is detailed. At last, this paper shows the experimental result based on the new algorithm and makes some useful conclusions.

Keywords: Annotation placement, template, principle of annotation placement, point feature

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No. 203

Modeling urban land use changes in Lanzhou based on artificial neural network and cellular automata

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ABSTRACT

This paper presented a model to simulate urban land use changes based on artificial neural network (ANN) and cellular automata (CA). The model was scaled down at the intra-urban level with subtle land use categorization, developed with Matlab 7.2 and loosely coupled with GIS. Urban land use system is a very complicated non-linear social system influenced by many factors. In this paper, four aspects of a totality 17 factors, including physical, social-economic, neighborhoods and policy, were considered synthetically. ANN was proposed as a solution of CA model calibration through its training to acquire the multitudinous parameters as a substitute for the complex transition rules. A stochastic perturbation parameter v was added into the model, and five different scenarios with different values of v and the threshold were designed for simulations and predictions to explore their effects on urban land use changes. Simulations of 2005 and predictions of 2015 under the five different scenarios were made and evaluated. Finally, the advantages and disadvantages of the model were discussed.

Keywords: Modeling, urban land use changes, artificial neural network, cellular automata

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No. 204

Study on the quantitative model of suspended sediment from MODIS in the Yangtze River

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ABSTRACT

Remote sensing techniques are used widely to observe bodies of water. Among satellite sensors commonly used for water quality studies, the Moderate-resolution Imaging Spectroradiometer (MODIS) has potential in water quality monitoring, because of moderate spatial resolution and high temporal resolution. In this paper, the utility of MODIS satellite imagery for suspended sediment monitoring in the estuary and the middle Yangtze River is investigated. Using the Yangtze estuary, China as an example, we explored the potential for using MODIS 250 m bands for suspended sediment study. It is shown that suspended sediment concentration correlates well with reflectance values retrieved from MODIS 250 m image data (R^2=0.85, n=25). In the middle Yangtze River, It is concluded that suspended sediment concentration correlates well with reflectance values (R_1-R_2)/(R_1+R_2) retrieved from MODIS 250m image data (R^2=0.72, n=41). Based on this correlation, we obtain the empirical model of suspended sediment concentration in the middle Yangtze River from MODIS. It is shown that it is useful for MODIS data to monitor this parameter of water quality.

Keywords: MODIS, suspended sediment, the Yangtze estuary, the middle Yangtze River

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No. 205

Study of 2G technique and method for millimeter-precision landslide monitoring

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ABSTRACT

The landslide monitoring has being paid to much academic attention by researchers in the world wide; and lots of monitoring technology has been put forward. Each monitoring technique and method has its own advantages, disadvantages and the application range. A new way for landslide monitoring, viz. 2G technique and method (the combination and integration of GPS and Georobot) is given in this article, which has the advantages of both GPS and Georobot, such as setting up datum point with GPS and monitoring deformation points with Georobot. Firstly, this article introduces several kinds of landslide monitoring technique and method and makes compare among them, then discusses and studies a series of its relevant key problems, such as the theory of polar coordinate measurement and its precision analysis, the method of interpolated meteorological correction, the method of differential correction etc., used during the process of from the scheme design to the implementation of landslide monitoring with 2G technique and method. And the feasibility and effectivity of the application of 2G technique and method for landslide monitoring is validated by testing and application. Finally, it points out that the discussion about 2G technique and method in this article has also important directive significance and application prospect for the deformation monitoring of other engineering.

Keywords: Landslide deformation monitoring, Georobot; combination of Georobot and GPS, method of polar coordinate measurement, method of interpolated meteorological correction, method of differential correction

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No. 206

Road extraction from high resolution remote sensing image based on mathematics morphology

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ABSTRACT

Extracting target information from the remote sensing images has been becoming an important method of updating the spatial geography data. With the development of spatial technology, sensor technology, digital image processing technology and the computer pattern recognition technology, how to extract target information from the high resolution remote sensing images has become the target of many researchers. Based on the feasibility experimental study of road extraction using Mathematics Morphology, this paper put forward one kind of road extraction method with Mathematics Morphology as primarily path and seed growing as auxiliary path. City road network information in high resolution remote sensing image is taken as the research object. In this paper Mathematics Morphology method and the segment method of Support Vector Machine are used. This paper presents that the combination of Mathematics Morphology and seed growing method has priority to Mathematics Morphology or seed growing used respectively, especially has the superiority in extracting the road detail information.

Keywords: road extraction, high resolution remote sensing image, seed growing, Mathematics Morphology

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No. 207

Gstruct: a system for extracting schemas from GML documents

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ABSTRACT

Geography Markup Language (GML) becomes the de facto standard for geographic information representation on the internet. GML schema provides a way to define the structure, content, and semantic of GML documents. It contains useful structural information of GML documents and plays an important role in storing, querying and analyzing GML data. However, GML schema is not mandatory, and it is common that a GML document contains no schema. In this paper, we present Gstruct, a tool for GML schema extraction. Gstruct finds the features in the input GML documents, identifies geometry datatypes as well as simple datatypes, then integrates all these features and eliminates improper components to output the optimal schema. Experiments demonstrate that Gstruct is effective in extracting semantically meaningful schemas from GML documents.

Keywords: Geography Markup Language(GML), GML schema, schema extraction

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No. 208

The research and application of network publish automation key technologies based on ArcIMS

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ABSTRACT

The development of WebGIS and its widely application provide a good technical support for the network map publishing. This article mainly researched the command of ArcIMS's ADMINCMD, and executed command management to the ArcIMS server with ArcXML technology. In this technical foundation, an automation publishing system based on ArcIMS server has been designed. It gives an example of application combined the Chongqing climate resources management information system.

Keywords: WebGIS, ArcIMS, ArcXML, ADMINCMD

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No. 209

Research on digital city geographic information common services platform

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ABSTRACT

Traditional GIS (Geographic Information System) software development mode exposes many defects that will largely slow down the city informational progress. It is urgent need to build a common application infrastructure for informational project to speed up the development pace of digital city. The advent of service-oriented architecture (SOA) has motivated the adoption of GIS functionality portals that can be executed in distributed computing environment. According to the SOA principle, we bring forward and design a digital city geographic information common services platform which provides application development service interfaces for field users that can be further extended relevant business application. In the end, a public-oriented Web GIS is developed based on the platform for helping public users to query geographic information in their daily life. It indicates that our platform have the capacity that can be integrated by other applications conveniently.

Keywords: GIS, Digital City, SOA, Geographic Information Common Services

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No. 210

Snail Identification Based on the Invariant Moments

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ABSTRACT

Based on the monitoring of Satellite Remote Sensing Images, a lot of big progresses have been made in environment analysis and researches about the schistosome snail breeding ground and the distribution of snails in marshland. This paper focuses on the identification of the Schistosome snail individual goals. Based on the image segmentation, the objects, including snails, are segmented from the background. Pattern features of the snails are extracted by calculating the invariant moments of typical snails. By calculating the invariant moments parameter of objects to be recognized and the Euclid distance of the feature parameters of swatches, the snail targets are identified. In the laboratory environment, the recognizing rate can reach over 90% and it has robust in rotation, scaling and translation.The steps can be described as follows:Step 1, by gray level modification, noise elimination, edge sharpening and binarization, the objects are segmented from the background.Step 2, typical snails' boundary is extracted by contour tracking and the central moments are calculated.Step 3, the central moments is normalized. The 7 invariant moments are calculated as the pattern features of the snails.Step 4, the boundaries of these objects are extracted by contour tracking and the central moments are calculated.Step 5, the central moments of the objects are normalized and the 7 invariant moments of the are calculated.Step 6, the Euclid distances of The 7 invariant moments between the objects and the typical snail are calculated. The objects with small distance will be judged as snails and the objects with large distance will not be judged as snails.

Keywords: targets identification, feature extraction, invariant moments, snails

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No. 212

Specialization of China large scale exchange market based on constrained co-local spatial association rule

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ABSTRACT

With quick development of economy, spatial distribution and specialization level of China large scale commodity exchange markets whose turnover are more than 100 million Yuan, have changed greatly. And influencing factors which distribute in the research region have attribute information and spatial information and do not satisfy statistical independence. Commodity exchange market specialization index is brought forward to measure specialization degree, based on the former research and constrained co-local spatial association rule is used to analyze symbiotic pattern between specialization level and influencing factors. Constrained predicate templates and association rule templates can improve mining efficiency greatly. As the result shown, large scale commodity exchange market specialization level on country-region spatial scale went down from 2000 to 2005 and rose at 2006. The interesting association rules extracted based on defined minimum support and confident can provide officers of region governments with rational advices on large scale commodity exchange markets planning and construction.

Keywords: Data mining, association rule, specialization, commodity exchange market

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No. 213

Landscape patterns and the optimal utilization of alpine grassland based on RS and GIS approach—A case study in TianZhu alpine grassland, Gansu province, China

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ABSTRACT

Using RS、GIS、landscape ecological technology to analyze landscape patterns based on alpine grassland region as the study area and TM/ETM+ image in 2002 as the study data in this article. Landscape patterns in the study area have been analyzed from such point of view as the landscape's patch characters, shapes, and spatial distributions through the indexes of diversity, predominance, fragmentation, evenness, and etc. The analysis on the ecological landscape patterns of land using indicates that the grassland occupies 45.45% and the woodland occupies 31.53% of the whole area. They are the main landscape types, which occupy 76.98% of the total study area and grassland is the matrix of the whole landscape according to ecological definitions. The distribution of landscape types has evident altitudinal tonality, and the distribution order is approximately as follows: town-residential area-farmland-grassland-woodland-unused land from valley to mountain top for the big vertical space of the height above the sea level. Take species protection as target communities, and depend on the surface pervasion consuming and the minimum clog model, we have designed much secure approaches of landscape patterns. Through analyzing we know the area of the chiasms buffer of class one in the grassland and the woodland is2422.15hm^2 and the perimeter is 19882.02km. The area of the buffer of class two is 879.79hm^2 and its perimeter is 10552.96km. Some fields and segments based on the minimum clog model need to pay much attention to:①The batch around cost isoclines layers in the central of grassland.②The Grassland-Woodland Ecotone should be mainly protected, and the textures among the small batches must be marked out in order to reduce the obstruction which species across the boundary. ③It must prevent the interferences caused by human being activities in the ecotone, and improve the using efficiency of physical flows and circulation efficiency of nutritional elements.④The isolated habitat batches and big landscapes must be joined together to keep species

continuance and bio-diversity increasing. Through advanced study, the number of landscape of the study area is simplex and integrated. The resident-industrial land and plantation landscape are separated and fragmentized. The matrix of grassland is preponderant. These results show that the study area has been disturbed by human being activities at present, but still in the safe range. We compared the study results with the field survey results, and found out that in the total of nineteen villages and towns, there are nine villages and towns in the range of safety area. The area is 358600 hm^2, which occupies50.16% of the total study area. About five villages and towns are in the range of critical safety area. The area is 187500 hm^2, which occupies 26.23%. Other villages and towns are in the range of insecure area. The area is 168800 hm^2, which occupies 23.61%. The results also indicate that the study area is safe as a whole, but the incertitude and insecurity areas have occupied 1/4 of the total. The ecological safety problem is extremely urgent and must be paid attention to and dealed with at once. The critical secure villages and towns are the easiest areas where can turn to insecurity from less safety. In addition, these critical secure villages and towns have larger areas than other types. So they must be prearranged and protected as a pivot. As the financial increasing in the alpine grassland area, its livestock and population have increased a lot in recent years. The pressure on the ecology and the environment will become more serious. So the inconsistency of the alpine grassland resources between their using and protection should be solved in time. How to accelerate the alpine grassland areas' sustainable using is the most important problem we have to resolve. In the process of analyzing, using pattern optimizing method, we have analyzed their relationships, whole landscape spatial structures and optimizing schemes. These innovations not only can provide decision-making support for the environment protection and cure, the biology diversity protection and the grassland sustainable using, but also can provide references on landuse optimizing and degenerate environment renewing for other similar areas. The method provides a good ecological route on the level's relevancy, and it's also a good supplement to the conventional landscape programming based on feasible evaluation. Under the guidance of the landscape ecology principles and methods, combining landscape using and landscape optimizing, a series of problems could be solved. Using RS and GIS technology, we can understand the main landscape about the grassland and the woodland through quantitative analysis in spatial patterns. This technology can reveal idiographic landscape structures and related problems of the study area. In a word, these methods are very valuable and convenient to analyze ecological landscape problems. However, the analysis data is not very ideal. For example, RS images scan cycle is long and its spatial resolution is poor. So it is difficult to get better images of grassland in the growing season under the interferential condition. The data is too complex to analyze one by one. Some results have shortages in calculating and analyzing precision. It will be ameliorated in the future study.

Keywords: TianZhu alpine grassland region, landscape pattern, land use, RS, GIS

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No. 214

Retrieving groundwater depth in the Lower Reaches of Tarim River by NDVI

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ABSTRACT

The changes of the coverage of vegetation and groundwater depth during the period of ecological construction and environmental protection are the most important two indicators of the level of success in ecological water transportation project in lower reaches of Tarim River.In this study, a new way to predict the groundwater depth in the arid regions has been presented. The spatial and temporal change of vegetation states in lower reaches of Tarim River under the ecological water transpiration have been discussed by using NDVI data derived from SPOT VEGETATION (VGT) NDVI S10 time sequence image data for the year 1999, 2003 and 2006. It is found that the groundwater depth played a dominant role in determining vegetation growth status in the lower reaches of the Tarim River. After the ecological water transportation, the vegetation has been restored in both sides of the watercourse stretching to Taitema Lake, which extend to 3 km in Akedun section, but decline along the stream flow as 1km in Kaogan section. However the area, which is 3km to 15km away from watercourse, has not been influenced obviously. And the area far away (excess 15km) has no influence. Statistic analysis shows that the groundwater depth has negative relationship with NDVI. And the groundwater depth in lower reaches of Tarim River has been successfully inversed through the statistic method; the simulation precision is 75%.

Keywords: ecological water transport, the lower reaches of Tarim River, NDVI, groundwater depth

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No. 215

Schematic Transportation Network Maps for Wayfinding in Urban Environments

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ABSTRACT

Schematic maps are effective tools for representing information about the physical environment and make user easy navigate for wayfinding. Evidence have shown that identifying how many categories of directions in urban street network environments, building taxonomy of branching points, and establishing a hierarchy of connecting roads will help produce effective schematic maps to ease wayfinding. Taking road semantic information and user demands into account, we first build the vector data model of hierarchy of connecting roads. Then we propose the four generalization algorithm and show the framework of how to generate schematic maps. Finally, schematic map on demand is designed in a concrete experiment, while keeping the topological consistency of the road network between original and schematic map.

Keywords: Schematic Map, Wayfinding, Generalization, Shape Simplification, Displacement

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No. 216

Automatic Geospatial Information Web Service Composition Based on Ontology Interface Matching

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ABSTRACT

With Web services technology the functions of WebGIS can be presented as a kind of geospatial information service, and helped to overcome the limitation of the information-isolated situation in geospatial information sharing field. Thus Geospatial Information Web service composition, which conglomerates outsourced services working in tandem to offer value-added service, plays the key role in fully taking advantage of geospatial information services. This paper proposes an automatic geospatial information web service composition algorithm that employed the ontology dictionary WordNet to analyze semantic distances among the interfaces. Through making matching between input/output parameters and the semantic meaning of pairs of service interfaces, a geospatial information web service chain can be created from a number of candidate services. A practice of the algorithm is also proposed and the result of it shows the feasibility of this algorithm and the great promise in the emerging demand for geospatial information web service composition.

Keywords: geospatial information web service, web service composition, ontology, interface matching

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No. 217

SAR Optimal Polarization Analysis based on Polarization Synthesis

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ABSTRACT

The polarization feature of the target could be expressed by both the scattering matrix and the Stokes matrix. In the Back Scattering Alignment (BSA) system, scattering matrix meets the principle of reciprocity and every element of it is a complex number. Stokes matrix is a transformed format of scattering matrix and reflects the relationship between SAR received power and transceiver antenna polarization status. For a deterministic target, there is a one-to-one correspondence between the scattering matrix and the Stokes matrix. Since the Stokes matrix is always a real symmetric matrix and has the nature of normal matrix. It is usually used to save polarized scattering data. With the development of polarization technology, polarization synthesis has already become one of the most important tools for polarization data analysis. An optimal polarization status and the maximum reception power must exist through different parameters combinations. That means target's optimal polarization. Traditional target's optimal polarization theory was based on the scattering matrix. But the scattering matrix is usually obtained difficultly, so the calculating process always be much complex. In this paper, we deduce the formulae optimal receive power based on Stokes matrix and polarization synthesis. The algorithm could be carried out easily and the programming process is much directly. Some experiments proof that ideal results could received by proposed algorithm.

Keywords: Target optimal polarization, Polarization synthesis, Stokes matrix, Kennaugh's optimal polarization, visible analysis, Data statistic

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No. 218

Indirect georeferencing of CBERS-2 imagery with position and attitude constraint conditions

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ABSTRACT

In this paper, a new indirect georeferencing method for linear array imagery is presented. The new method fully utilizes the original orientation elements directly measured by geopositioning system carried on the satellite. First the systematic errors contained among linear and angular elements were modeled by second order polynomial functions depending on time. The constant terms compensate the shifts and angular drifts between the image system and the GPS and star sensor system. The linear and quadratic terms model the additional systematic errors. There are 18 parameters which should be estimated for image georeferencing. Considering the strong correlation among those orientation parameters, they were treated as virtual observations and the weights were assigned according to prior-knowledge such as the precision of sensor position and attitude observations. By this step, the value change of orientation parameters in adjustment process can be constrained reasonably. The new method has been tested on two scenes of CBERS-2-3 satellite images. In the tests, the location accuracies of 15~25m for planimetry have been obtained using the adjusted orientation elements, greatly improved compared to the direct georeferencing results. Actually, the results should be even better if the measuring errors of image point can be further reduced.

Keywords: indirect georeferencing, linear-array sensor, space photogrammetry, image orientation, accuracy

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No. 219

A Circuitous shortest path algorithm labeled by previous-arc vector group in navigation GIS

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ABSTRACT

Path planning, as the core module of navigation GIS, its efficiency and accuracy has a crucial impact on the navigation system. General shortest-path algorithm is based on the classic node label-setting algorithm, which does not consider the situation of including circuitous road sections. Therefore, sometimes it will neglect the closer circuitous path at hand but find the farther path or even failed to find any path in the real road network with complicated traffic restrictions. For the sake of finding more accurate path, this paper presents a circuitous shortest path algorithm labeled by previous-arc vector group. Firstly, we generate incremental network topological relationships according to two random positions travelers are interested in. Secondly, we construct a vector group including previous arc, and seek the way by labeling the previous-arc vector group. Finally, the shortest path in the sense of mathematics which may contain circuitous road sections can be acquired. An experimental work has been done with this algorithm using the map of Beijing, which showed that the algorithm not only well improved the accuracy of the shortest path result between the two random positions in the road network, but also kept the efficiency of the classic node labeled algorithm.

Keywords: Previous-arc vector group, label-setting, circuitous path, shortest path, road network

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No. 220

The Spatial Relationship Analysis of Regional Development Potential and Resource & Environment Carrying Capacity in China

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ABSTRACT

The main goal in this study is to explore the spatial relationship of Chinese regional development potential (DP) and resource & environment carrying capacity (REC) in 2000 and 2006 by using meta-synthesis of spatial statistical analysis and GIS technique. The results show that: The spatial distribution trend of DP and REC are overall gradient descending from coastal to inland, then to the western provinces. They all demonstrate that spatial agglomeration with global significant, namely high-DP regions aggregated in the east, low-DP regions aggregated in the west. The high-REC of central, eastern and southern China are improved and aggregated, but the low-REC aggregated in northwest. Chinese regional DP and REC are divided into five different kinds of regions based on the results of k-means clustering analysis and spatial clustering, which demonstrate that each area's DP and REC's spatial association measure is not very obviously. Compared to the high-DP region, the low-DP region is more restricted to the REC.

Keywords: development potential, resource & environment carrying capacity; spatial statistical analysis, China

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No. 221-2

Remote sensing- and GIS- based analysis of construction land change in the late 1990's in Sichuan Province

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ABSTRACT

A study on the change feature of the construction land is very important to the construction land plan and management in Sichuan Province. Therefore, this paper tries to discover the change feature of the construction land in Sichuan province by using the technologies of remote sensing and GIS. The dynamic change feature revealed in the paper is that the net increased construction land totally amounts to 33854 hectares that is mainly resulted from the transformation of cultivation, accounting for percent 84. In terms of the environment features of the construction land change, the net increased construction land that mainly occurred in the regions with the slope below five degree accounts for percent 88 while that mainly occurred in the regions with slight and light soil erosion accounts for percent 94 and that mainly occurred in the regions with the environment quality grade above grade seven accounts for percent 91. The spatial distribution feature of the construction land change is that the net increased construction land is mainly distributed in the plain and hills, accounting for percent 80, and mainly distributed in Chengdu, Leshan, Meishan and Mianyan cities, accounting for percent 53. It was also shown that the cites whose construction land sprawled above 0.7 times their areas in 1995 included Ya'an, Zigong, Leshan and Mianyang.

Keywords: Construction Land, remote sensing, dynamic change feature, spatial distribution feature, Geographic Information System

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No. 223

VGEs-Oriented Multi-sourced Heterogeneous Spatial Data Integration

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ABSTRACT

The world of today heavily relies on spatial data to manage the natural and built environments, also to construct virtual geographic environments (VGEs). After analyzed the characteristics of multi-sourced heterogeneous spatial data in VGEs, a Data Representation Model oriented to VGEs (XGE-DRM) was designed in this paper. The XGE-DRM provides not only a clear description of the data, but also defines the relationships among the data, it is critical for users to interpret data correctly. XGE-DRM provides a common data model to define a data representation structure for traditional data and spatial data. Using it, users can customize their geographic data to correctly interpret other data. Then the processes and framework of multi-sourced heterogeneous spatial data integration were proposed, and the spatial data parsing was discussed. Lastly, the platform system of multi-sourced heterogeneous spatial data integration was designed and developed under the VS.NET2005 development environment combined with XML technology, and it can solve the bottleneck problems arise in geographic information resources which under the heterogeneous environment. Some experiments were designed and discussed, by those experiments; it had shown that the platform we developed can integrate multi-sourced heterogeneous spatial data effectively and were works better than other similar platform systems.

Keywords: multi-sourced heterogeneous spatial data; data integration; XGE-DRM; virtual geographic environments

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No. 224

Classification of Airborne Laser Scanning Data Based on Statistics of Height Information

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ABSTRACT

This paper presents two new methods for segmentation of LIDAR points data by height histogram analysis. In this researcch, height information slicing is first conducted by height interval or number of dispersion, and histogram is performed by statistics of sliced height information. Then height histogram is analyzed to determine the segmentation mode. According to the different segmentation mode, certain optimal threshold algorithms are chosen and applied to histogram, and optimal threshold or series of optimal thresholds are obtained to finish the division process. The two methods, Multi-thresholds By Total Histogram and Multi-thresholds By Subarea Histogram, are discussed and implemented to a certain data set. At the end of the paper, some case studies are given to achieve the segmentation results and effects of slice number and the chosen algorithms are compared.

Keywords: Statistics, Histogram, Data Segmentation, Optimal Threshold

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No. 225

Wavelet transform based edge detection of non-uniform illumination image

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ABSTRACT

The distributions of irradiance on the image plane decrease away from the center of the image even if the scene is a uniform white field. This crucial problem is posed in digital image processing, such as edge detection and stereo matching. This paper presents an edge detection method of non-uniform illumination image which uses fitting calibration algorithm to correct the non-uniformity and wavelet transform to extract edges from the images corrected. The experimental results demonstrated the validity of our theoretical model and the effectiveness of wavelet transforms based edge detection of non-uniform illumination image.

Keywords: wavelet transforms, non-uniformity correction, edge detection

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No. 226

An algorithm for automatically matching corresponding points on homonymous map features

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ABSTRACT

An algorithm for automatically matching corresponding points on vector map features is put forward in this paper. Firstly, a feature simplification approach resembles Douglas-Peucker algorithm is designed to simplify geometrical entities, but here the offset threshold of Douglas-Peucker algorithm is substituted by similarity coefficient threshold defined in this paper. This approach can ensure that simplification result of map feature is invariable to affine transformation if only the value of similarity coefficient does not change. Secondly, this algorithm extracts convex hulls of boundaries of map features which have already been simplified. Lastly, the corresponding points on the convex hulls can be recognized and matched automatically according to pre-defined matching rules. The matched corresponding points are critical points which distribute uniformly along the boundary of map feature. The experiments indicate that this algorithm is efficient and can be applied in the field of map conflation.

Keywords: matching corresponding points, map conflation, feature simplification, similarity coefficient

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No. 230

Research on Setting up a data quality system for topographic mapping of west China

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ABSTRACT

In order to develop a quality assurance system for maps thus obtained from the National Western Surveying and Mapping Project on 1:50000 Topological Maps Blank Area, a spatial data quality check method based on entity and evaluation method by implementing the cloud theory and rough set is going to be put forward in the paper. First, spatial data quality problems are to be analyzed and possible quality problems will be described. Secondly, a digital linear graphic spatial data quality model is built and the quality elements and sub-elements are elaborately summarized. Next, spatial computing operators that the check process demands are given. The weight of each index is calculated according to importance of attribute in rough set. Cloud decision generator transforms indexes value into qualitative evaluation. Finally, the homologous software of the spatial data quality check and evaluation is developed to control spatial data quality. Therefore a spatial data quality control and evaluation technique system is founded. It shows that the check and evaluation methods are feasible and software has higher automation from the experiment.

Keywords: spatial data, quality control, digital linear graphic, cloud model, China western area

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No. 231

Urban land use change detection through spatial statistical analysis using multi-temporal remote sensing data

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ABSTRACT

Numerous remote sensing change detection methods have been used in urban land use change identification and analysis, in which image regression is regarded as effective as other approaches. Traditional image regression approaches for change detection often produce unsatisfactory results by assuming the relationships in study data in a consistent manner in place, and spatial correlation between pixels inherent in remote sensing images is usually ignored in the analysis. Geographically Weighted Regression (GWR) addresses this weakness by obtaining local parameter estimates for each observation. This paper reports preliminary results from a study applying GWR to the land use change detection in urban center and urban fringe of Nanjing city, China, using satellite images of 2000 and 2004. The results show that the use of GWR can identify the land use change, the global patterns, the local patterns, as well as the points not consistent with local patterns in the urban environment; and the under-development and over-development points are also detected by GWR model.

Keywords: Geographically weighted regression, change detection, remote sensing, spatial autocorrelation, Nanjing city

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No. 232

Development and Research on the GIS-Based Landslide Prediction System of the Three Gorges Area

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ABSTRACT

In this paper we discussed the development and research of the GIS-based landslide prediction system of the Three Gorges area. First of all, we systematically revisited the basic issues of the landslide prediction, including the principles of landslide prediction, the division of sliding-time and sliding-deformation stages, prediction parameters selection and monitoring sites selection. In addition to reviewing the landslide prediction models, this paper detailed discussed an improved model which makes an integration of the results of multiple prediction models. On the basis of those landslide prediction models, we developed a GIS-based landslide prediction system by using Visual C#.NET and ESRI ArcObjects components. Finally, this paper selected two typical landslide cases in the Three Gorges area: the Xintan landslide and the Lianzi Cliff dangerous rock body, and used the system to calculate and analyze. It validated the applicability and accuracy of the prediction models, made a test of the practicality of the system, and achieved good results.

Keywords: landslide, prediction model, GIS

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No. 233

Grid based model computation of Virtual Geographic Environment —Application in Pearl River Delta air pollution visualization

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ABSTRACT

Virtual Geographic Environment (VGE) is a virtual representation of the physical world, culture world and imaginary world. Compared with GIS, VGE has two core components, which are Data and Model respectively. Many models in VGE are complex and therefore the model calculations for them are very time consuming as well. How to decrease and reduce the required model computation time to improve VGE efficiency will be a vital and key issue for most of the VGE implementation. In this research, we adopt CUGrid as the model computation server, which contains more than two hundred CPUs for fast and intensive computation. With the CUGrid, MM5 based air pollution data in Pearl River Delta is used as the test case for this study. According to the test results, we managed to reduce the required model computation time from the original three months on one specific desktop to several minutes on the CUGrid. Another significance and benefit of this research is that we also able to integrate MM5 with geographic information, which makes concepts on air pollution can easily be understood by the public.

Keywords: Virtual Geographic Environment, Pearl River Delta, Air pollution, Grid, model computation, visualization

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No. 235

Topological Relations under Uncertainty in GIS Spatial Data

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ABSTRACT

Spatial relation theory is one of the hottest research topics in the GIS circle both at home and abroad. This research intends to analyze relevant research findings over the past more than a decade and latest academic development to point out major problems and inadequacy in existing researches, focusing on the topological relations and uncertainty in GIS to engage in a systematic investigation. This research discusses the present situation of the overall GIS field, the development of GIS, and features of the present development of GIS technology. It also investigates and analyzes relevant issues, such as the uncertainty in topological relations which is caused by the inaccuracy of, and uncertainty in, GIS spatial data, spatial reasoning, spatial searching, spatial-searching language, image segmentation, the theoretical development of topological relations, the trend of GIS development, and the problems in the development of GIS in the 21st century. The "egg-yolk model" is formulated. The "egg" is the maximum range of the fuzzy target while the "yolk" is the minimum range of the fuzzy target and the "white" is the scope of the uncertainty

Keywords: Geographic Information System, Spatial data, Image Segmentation, Topological Relations, Uncertainty, Inconsistency

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No. 236

A user profile model for intelligent delivery of spatial information

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ABSTRACT

Conventional spatial information delivery is system-oriented, and users have to adapt to the system and complete the delivery of spatial information. Two disadvantages exist in the delivery service mode: (1) users' personalized requirements cannot be satisfied; (2) Initiative delivery service cannot be provided for users. In this paper, we firstly classify conventional user profile models into four categories. After analyzing the limitations of these user profile models, we conclude that conventional user profile models are not suitable for the application of spatial information intelligent delivery. Then, aiming to the objectives of spatial information intelligent delivery, we propose a user profile model of spatial information, and give the building method of the model. Also, we put forward a similarity measure method between spatial information and user profile. In order to verify the availability of the user profile model, we present an example of spatial information intelligent delivery. The experimental results show that the proposed user profile model can reflect user profile quite well.

Keywords: User profile, spatial Information, intelligent delivery, recommender system, geographic information science

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No. 237

Testing prediction models of land subsidence on GPS permanent station

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ABSTRACT

Due to the heavy withdrawal of underground water for cultivating fishery and industrial factories, the land subsidence occurred in southwestern Taiwan has resulted in environmental hazard and potential risk. In order to fully realise the subsidence characteristics and establish a subsidence prediction function for any possible application in the study area, the height variation was estimated and tested for the representative site of Pei-Kang (PKGM), using some selected models, i.e. the linear regression, grey theory and artificial neural network. Since different estimation models associate with different time spans of the data, a series of GPS-based vertical coordinates was categorised into two groups of data set, namely a long-term (52 weeks) data set and a short-term (5 weeks) data set, both collected at PKGM for around 10 years (from 1996 to 2005). Using short-term data set, the prediction errors showed that a linear regression model works slightly better than grey theory. Since the land subsidence is possibly related to various natural factors, such as time, stream flow rate, ground water elevation or underground water level, etc., this paper also investigates the factor identification based on the height predictions using a multi-variant type of regression model and artificial neural network model. It was found that the prediction models can present a 1 cm level of height prediction error. Moreover, the most dominating influence factor was tested to be the variable of time. An artificial neural network operated with the main factor of time is capable of working with the long-term GPS data set to effectively predicate a 1 cm level of height variation in a significant land subsidence area.

Keywords: land subsidence, grey theory, regression, artificial neural network

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No. 238

PDEAR Model Prediction of Protea Species in Year 2070-2100

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ABSTRACT

Global warming and climate changes are changing the environment and therefore changing the distribution and behaviour of the plant species. Plant species often move and change their distributions as they find their original habitats are no longer suitable to their needs. It is therefore important to establish a statistical model to catch up the movement and patterns of the endangered species in order to effectively manage environmental protection under the inevitable biodiversity changes that are taking place. In this paper, we are focusing on the population category of rare Proteas that has an estimated population size from 1 to 10 per sample site, which is very small. We used the partial differential equation associated regression (PDEAR) model, which merges the partial differential equation theory, (statistical) linear model theory and random fuzzy variable theory together into a efficient small-sample oriented model, for the spatial pattern changing analysis. The regression component in a PDEAR model is in nature a special random fuzzy multivariate regression model. We developed a bivariate model for investigating the impacts from rainfall and temperature on the Protea species in average sense in the population size of 1 to 10, in the Cape Floristic Region, from 1992 to 2002, South Africa. Under same the average biodiversity structure assumptions, we explore the future spatial change patterns of Protea species in the population size of 1 to 10 with future (average) predicted rainfall and temperature. The spatial distribution and patterns are clearly will help us to explore global climate changing impacts on endangered species.

Keywords: Partial Differential Equation Associated Regression (PDEAR) model, Protea, South Africa, climate change, Cape Floristic Region

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No. 239

Research on land use/cover change of Wuhan based on object oriented Image interpretation method

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ABSTRACT

Higher resolution remote sensor has already become the significant instrument to obtain the change information quickly, veraciously, and comprehensively. Two different remote sensing images are used to obtain the change information by using an object oriented analyzing method in Land Use/Cover Change. Data is gathered according to the images' resolution, characteristic, size and texture property of the earth surface objects. Meanwhile, the color, shape, smoothness, and compactness of the images are reviewed to form many-adjacent-pixel objects which contain more semantic information. Combined with the knowledge of land use classification and loading classifier of discriminate class, a characteristic space is defined to establish a knowledge base. Two or three different typical features are chosen to serve as the training samples, and a data base could be completed successfully. Non-segmented or error-segmented objects are adjusting into correct ones favorably. Analyzing the data, only the areas of the lands for construction purpose and reservoir & bottomland have been increased in the whole city, while the areas of arable land, river & lake land, woodland, grassland, and not exploited or developed land have been decreased in more or less degree ,which means that a tendency to expansion has become more and more significant.

Keywords: Image Interpretation, Classification, Image Understanding, Feature Generalization, Land Use Mapping

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No. 240

A non-planar data model for road networks based on GIS-T

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ABSTRACT

Previous data models of road networks include planar and non-planar models. In planar models, intersections of road networks are transformed into arcs, sections into nodes, and sequential pairs are used to represent arcs between nodes, which can simulate traffic direction of sections and turning limitation at intersections well, but fail to define the granularity of lane and the node height difference. Non-planar data models provide the data of node height difference, which avoid impossible turning in three-dimensional road networks, but shortages as lack of detailed information of road intersections and node height difference and the curtly defined granularity of lanes lead to the low efficiency of analysis of road networks. This paper proposes an NA+ model of road networks based on non-planar structure and combined node height difference with direction lane to describe non-planar structure of road networks. Node height difference is denoted as Arabic numerals, the granularity of lane is specified as direction lane. In GIS-T database, the intersection table and the direction lane table are used to describe node height difference and direction respectively. The model consists with the circumstance of road networks; it is proved to be applicable and feasible to the applications of GIS-T.

Keywords: geographical information system for transportation (GIS-T), road networks, non-planar data model, node height difference, direction lane

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No. 241

The Animation of Tree Development Based on Timed L-systems

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ABSTRACT

In the area of forest RADAR remote sensing, L-system is often used to obtain realistic tree structures and the components. With the development of knowledge and computer graphics, static tree models simulated by computers are animated. Timed L-systems and tree growth functions are introduced to model and visualize the growth of those static tree models we developed before.

Keywords: Timed L-system, tree growth model, Radar, Remote Sensing

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No. 242

Ground deformation monitoring in Pearl River Delta region with Stacking D-InSAR technique

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ABSTRACT

The main problems, temporal and geometrical decorrelation, atmospheric signal, limited the analysis and interpretation of Differential SAR (D-InSAR) interferometric signal. The Permanent Scatterers (PS) Technique which can detect discrete and temporarily stable natural reflectors using at least 25 images was developed shortly after. However, for some regions, there are not enough available archived SAR images. The Stacking D-InSAR technique, using a stack of SAR images (<20scenes), with the generated a set of unwrapped differential interferograms, can estimate the linear differential phase rate. This research employs 6 ENVISAT ASAR images to study the ground deformation in The Pearl River Delta region with Stacking D-INSAR technique. Obvious ground subsidence trend is found around Guang Zhou, Fo Shan and Dong Guan where the urbanization process was very fast in the past 20 years. In order to validate the stacking result, Persistent Scatterer technique with limited images is also applied. From the deformation velocity map obtained by stacking technique, it is found the deformation velocity rate at some places seems higher. The main reason is probably the presence of atmospheric artifacts. The deformation trend shown in both Stacking technique and the Persistent Scatterer technique result are consistent in Haizhu district and Yuexiu district in Guangzhou.

Keywords: ground deformation, D-InSAR, Stacking D-InSAR technique, Persistent Scatterer technique, Pearl River Delta

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No. 243

Shanghai Urban Green Landscape Model System Based on MapServer

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ABSTRACT

Based on RS and GIS, the 2003a's aerial image data of Shanghai is taken as data source. According to the urban green landscape theory, the green landscapes are well classified to park, street green landscape, affiliation green landscape, inhabited green landscape, production green landscape and defending green landscape, et al. Several spatio-temporal models including the space expansion models and ecological analyzing models for urban green landscape have been constructed and calculated. Then, based on the ORDBMS platform PostgreSQL and OGIS MapServer, the urban green landscape database including the above six types green landscapes spatial data and model system of Shanghai have been developed. At last, using the powerful statistics analysis function of the model system, this paper discusses and reveals the impacts of urban space development on green landscape pattern, structure and function. At the same time, the general distribution characteristics of green landscape pattern have been researched at three levels such as green patch level, type level and mosaics structure of different green landscapes. The urban green landscapes model system of Shanghai based on MapServer provides a powerful interactive and perfect platform for governments to make urban planning decisions and landscape study.

Keywords: urban green landscape, spatio-temporal pattern, model system, MapServer, Shanghai

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No. 244

Study on framework of GIS-based model metadata

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ABSTRACT

This paper first defines the concept of GIS-based model(GBM) metadata and analyzes its hierarchy. The second section gives the contents of GBM declarative metadata and services metadata. Then this paper defines the primary mode of GBM metadata based on XML Schema. Finally, this paper discusses the flows of development and application for GBM metadata. This paper improves the GBM attributes information management, which can advance GBM management efficiency and integration ability.

Keywords: GIS-based model (GBM), metadata, model attribute information management, XML schema

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No. 245

Combining Remote Sensing Image with DEM to identify Ancient Minqin Oasis, northwest of China

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ABSTRACT

The developing and desertification process of Minqin oasis is representative in the whole arid area of northwest China. Combining Remote Sensing image with Digital Elevation Model (DEM) can produce the three-dimensional image of the research area which can give prominence to the spatial background of historical geography phenomenon's distribution, providing the conditions for extracting and analyzing historical geographical information thoroughly. This research rebuilds the ancient artificial Oasis based on the three-dimensional images produced by the TM digital Remote Sensing image and DEM created using 1:100000 topographic maps. The result indicates that the whole area of the ancient artificial oasis in Minqin Basin over the whole historical period reaches 321km^2, in the form of discontinuous sheet, separated on the two banks of ancient Shiyang River and its branches, namely, Xishawo area, west to modern Minqin Basin and Zhongshawo area, in the center of the oasis. Except for a little of the ancient oasis unceasingly used by later people, most of it became desert. The combination of digital Remote Sensing image and DEM can integrate the advantages of both in identifying ancient oasis and improve the interpreting accuracy greatly.

Keywords: Digital Remote Sensing image; Digital Elevation Model (DEM); Minqin Basin; Ancient Oasis; Rebuild

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No. 246

Spatial distribution of Incoming Potential Solar Radiation based on Solar Analyst model and DEM in Xinjiang, China

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ABSTRACT

Incoming solar radiation is the primary driver for physical and biological process in the earth. Human activities, such as agriculture, forestry, land management, etc, ultimately depend on solar radiation. At a global scale, the geometry of earth's rotation and revolution about the sun cause the gradients of solar radiation. But topography is the major factor modifying the distribution of solar radiation at a landscape scale. Spatial solar radiation models provide a cost-efficient means for understanding the spatial variation of solar radiation over landscape scales. Geographic Information system (GIS) has become established tools for analyzing such models. Among such models, the Solar Analyst draws from the strengths of both point-specific and area-based models. It can calculate solar radiation integrated for any time period. In this paper, this model was used to estimate the spatial distribution of incoming potential solar radiation in Xinjiang, China. The 1km resolution digital elevation model (DEM) derived from 1:250000-scale topographic maps and other topographic factors (altitude, slope, aspect, etc derived from DEM) of Xinjiang were used as the basis for generating digital maps of the important parameter required to run Solar Analyst model. With the assistant of topographic factors and Solar Analyst model, the spatial distribution of monthly incoming potential solar radiation with 1km resolution was estimated. Actual solar radiation data were obtained from 13 meteorological stations for the result validation. Validation determined that the mean relative error (MRE) of incoming potential solar radiation ranges from 3.8% in Jul to 12.2% in Dec and the mean value of monthly MRE is 7.1%. The MRE is larger in winter than in other season. In conclusion, the simulated results of model are basically up to the level of application requirement. The Solar Analyst model may serves as a good tool for estimating spatial patters of monthly incoming potential solar radiation in Xinjiang. Application of Solar Analyst in Xinjiang and analysis of the spatial distribution characteristics of monthly incoming potential solar radiation have great significance for the research fields of agriculture, forestry and ecology in Xinjiang, China.

Keywords: Solar Analyst model, DEM, Incoming potential solar radiation, Xinjiang

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No. 247

Research on the Urban Sprawl Based on GIS and CA

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ABSTRACT

The complex urban system can't be simulated directly by the traditional and static models. Cellular automata (CA) is a kind of dynamically modeling framework from bottom to top, which possesses the capability of modeling spatial-temporal evolvement process of a complicated geographical system. The peculiarities of CA are apt for simulating urban sprawl, urban expansion and land use evolution, which make the application of CA become very popular. The environment of CA simulation can be improved by using the CA model integrated with GIS to simulate the urban sprawl, and new parameters and transition rules can be found out by establishing classical urban CA. The paper summarizes the status and the application of urban CA in the world, develops a CA model named GIS-CA on the basis of the principle of CA, integrated with GIS and RS, adds urban plan as controlling factor into GIS-CA model, and uses GIS-CA model to simulate and forecast urban sprawl, and takes Luoyang City as the case study. The simulation and forecast results are acceptable for that the precision and Lee-Sallee shape index are rational.

Keywords: GIS, CA, ArcObject, urban sprawl, Luoyang City

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No. 248

Application Research of Environmental Disaster Spatial Information Semantic Grid Based on Geo-ontology

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ABSTRACT

According to the heterogeneous and spatial characteristic of environmental disaster events, this paper uses wetland information distributed in different administrative departments of Wuhan as research objects, attempts to construct an integrated and interoperation system based on semantic grid to tackle with the sudden environmental disaster. Through the conversion from domain (node) ontologies to universal ontologies in the spatial information semantic grids of environmental disaster, we can resolve the distribution and heterogeneity problem of the spatial information about environmental disaster, and logically provide users a virtual single spatial information view. With the management, registration and service mechanism of environmental disaster information and resource based on geographic ontology, all the operation are based on semantic. It can implement the grid calculation based on semantic and the integration and interoperation of environmental disaster spatial information and resources. As the instance shows that, the system can settle the heterogeneity problem of various GISs in a certain extent, and facilitate the semantic integration and interoperation among various systems.

Keywords: geographic ontology, wetland, environmental information, semantic grid

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No. 249

The Research of Web GIS Based on Portal

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ABSTRACT

With the rapid development of computer network technologies and distributed computing technologies, more and more enterprises begin to accept and use Web GIS. As a result of the thought that traditional Web GIS has focused on system, a number of existing Web GIS are isolated by each other, and facing the problems with data islands and function overlaps, which results in the waste of spatial data resources, the redundant construction of spatial information service, the difficulty of system integration and so on. All of these demands that the new generation Web GIS should focus on users, be service-oriented and be easily integrated systems. The introduction of Portal can solve difficulties above. This paper studies how to bring in Portal in the process of designing and developing Web GIS to solve the difficulties of resource integration and the personalized services of users. And the author has successfully implemented a Web GIS Portal based on JSR 168 Java Portlet Specification. The facts have proved that a Web GIS developed by Portal can provide users with better user experience and be easily integrated with other application systems.

Keywords: Web GIS, Portal, Portlet, GIS Portal, Resource Integration, Cooperation, EAI.

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No. 250

Cloud Detection in MODIS data based on spectrum analysis and snake model

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ABSTRACT

Clouds in satellite images must be precisely identified prior to any further analysis in any case. A new cloud detection algorithm based on spectrum analysis and snake model is put forward in this paper. According to the distinction of the spectral bands for the MODIS and the spectrum curve of different objects, we can differentiate the cloud from other objects well by the band1, band6 and band26. Because the distinct difference between cloud and the earth's surface, the detected thresholds have good robustness, and they are not sensitivity to images. Then we can optimize the cloud boundary by snake model. We adequately use the image information of the three bands in snake model via color gradient. By balancing these model-based and data-driven energy terms using regularization parameters, the snake algorithm can extract very accurate cloud boundaries without gaps and spurious branches. According to numerous experimental results, the new cloud detection algorithm in this paper is simple, feasible and suitable.

Keywords: MODIS data; multi-spectral synthesis; snakes; cloud detection; color gradient

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No. 251

Entropy uncertainty of multi-dimensional random variable

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ABSTRACT

Research on positional uncertainty of point is the basis of modeling uncertainty of line segment and polygon. The positional uncertainty indices of point have been widely studied in topography and metrology. In this paper, the exist entropy uncertainty interval of one-dimensional random variable is extended to the circumstances of two-dimensional, three-dimensional and N-dimensional by introducing the theory of information entropy. The indices of entropy uncertainty ellipse, entropy uncertainty ellipsoid and entropy uncertainty super ellipsoid are presented, which can be considered as the indices of uncertainty degree of the random point in two-dimensional, three-dimensional and multi-dimensional. The entropy indices presented in this paper are unaffected by the objective selection of the confidence level. And they are especially suitable for uncertainty measurement of the random points with unknown distribution in GIS.

Keywords: multi-dimensional random variable; uncertainty; information entropy; entropy uncertainty degree

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No. 252

Temporal and spatial characteristics of wet-dry climate variation in the northern slope of Tianshan Mountains, Xinjiang

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ABSTRACT

Based on the monthly temperature and rainfall data of 1961-2006, aridity is calculated and its multi-time scales characteristics in different divisions in the northern slope of Tianshan Mountains have been analyzed using Mexican Hat wavelet analysis in this article. The periodic oscillation of aridity variation and the points of abrupt change at different time scales along the time series are discovered. Also the trend of climate change is tested. Additionally, possible association of climate variation in this area with ENSO is explored using SOI date series. The research results indicate that there exist obvious regional characteristics of wet-dry climate variation in the northern slope of Tianshan Mountains. Wavelet analysis shows that there mainly exits two modes of scales (12-24 years and 4-8 years) in every division, while catastrophe point differs in different zones. To predict on the scale of 12-24 years, it will be relatively dry in mountain division and desert area in a period after 2006. In addition, the transition from warm-dry to warm-wet appears in oasis area. Correlation analysis indicted that aridity variation of the northern slope of Tianshan Mountains is affected by ENSO, while influence degree is different between areas; furthermore, this influence is one-year lagging behind ENSO in the whole area.

Key words: climate variation, temporal and spatial characteristics, wavelet analysis, ENSO

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No. 254

Study on Data Model of Large-scale Urban and Rural Integrated Cadastre

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ABSTRACT

Urban and Rural Integrated Cadastre (URIC) has been the subject of great interests for modern cadastre management. It is highly desirable to develop a rational data model for establishing an information system of URIC. In this paper, firstly, the old cadastral management mode in China was introduced, the limitation was analyzed, and the conception of URIC and its development course in China were described. Afterwards, based on the requirements of cadastre management in developed region, the goal of URIC and two key ideas for realizing URIC were proposed. Then, conceptual management mode was studied and a data model of URIC was designed. At last, based on the raw data of land use survey with a scale of 1:1000 and urban conversional cadastral survey with a scale of 1:500 in Jiangyin city, a well-defined information system of URIC was established according to the data model and an uniform management of land use and use right and landownership in urban and rural area was successfully realized. Its feasibility and practicability was well proved.

Keywords: urban and rural integrated cadastre, conceptual design, data model, village block

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No. 255

The evolution of geographic information systems from my view

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ABSTRACT

Over the past more than four decades since its inception in the 1960s, Geographic Information Systems (GIS) has become more advanced and technologically mature in its geoprocessing and analytical tools. This paper provides an overview of the evolution of GIS, and puts forward my viewpoint that the development of GIS is intimately related to that of the three disciplines which constitute the core of GIS: Geography Science, Information Science, and Computer Science. Based on the analysis on the future development of Geography Science, Information Science, and Computer Science, as well as their crossover, infiltration, and integration trend, the paper provides an outlook on the prospect of GIS being developed into a system of Geographic Information Science and realizing a "Digital Earth" engineering.

Keywords: Evolution of Geographic Information Systems, Geography Science, Information Science, Computer Science

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No. 256

Formalized Description and Construction of Semantic Dictionary of Graphic-text Spatial Relationship

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ABSTRACT

Graphic and text are two major elements in exhibiting of the results of urban planning and land administration. In combination, they convey the complex relationship resulting from spatial analysis and decision-making. Accurately interpreting and representing these relationships are important steps towards an intelligent GIS for urban planning. This paper employs concept-hierarchy-tree to formalize graphic-text relationships through a framework of spatial object lexicon, spatial relationship lexicon, restriction lexicon, applied pattern base, and word segmentation rule base. The methodology is further verified and shown effective on several urban planning archives.

Keywords: graphic-text relationship, spatial relationship, semantic dictionary, applied pattern base

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No. 257

Research on Automatic Optimization of Ground Control Points in Image Geometric Rectification Based on Voronoi Diagram

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ABSTRACT

With the development of remote sensing satellites, the data quantity of remote sensing image is increasing tremendously, which brings a huge workload to the image geometric rectification through manual ground control point (GCP) selections. GCP database is one of the effective methods to cut down manual operation. The GCP loaded from database is generally redundant, which may result in a rectification slowdown. How to automatically optimize these ground control points is a problem that should be resolved urgently. According to the basic theory of geometric rectification and the principle of GCP selection, this paper deeply comprehends some existing methods about automatic optimization of GCP, and puts forward a new method of automatic optimization of GCP based on voronoi diagram to filter ground control points from the overfull ones without manual subjectivity for better accuracy. The paper is organized as follows: First, it clarifies the basic theory of remote sensing image multinomial geometric rectification and the arithmetic of how to get the GCP error. Second, it particularly introduces the voronoi diagram including its origin, development and characteristics, especially the creating process. Third, considering the deficiencies of existing methods about automatic optimization of GCP, the paper presents the idea of applying voronoi diagram to filter GCP in order to complete automatic optimization. During this process, it advances the conception of single GCP's importance value based on voronoi diagram. Then by integrating the GCP error and GCP's importance value, the paper gives the theory and the flow of automatic optimization of GCPs as well. It also presents an example of the application of this method. In the conclusion, it points out the advantages of automatic optimization of GCP based on the voronoi diagram.

Keywords: Remote sensing,, geometric rectification, ground control point, voronoi diagram

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No. 259

Seamless Integration of Data Services between Spatial Information Grid and TeraGrid based on Broker-based Data Management Model

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ABSTRACT

Most of the space agencies have built Grid systems to manage large volumes of spatial data archives and products. However, the heterogeneous data structure, the distributed storage location, and the gradual progress of building data service systems, make such spatial grid systems to be grid islands. The broker-based manage model can hide complexity and heterogeneity of spatial data sources, so that the research on broker-based data service is meaningful to promote inter-Grid collaboration for earth observation applications. This paper discusses the special problems of spatial information integration and some features of broker-based data management model. We demonstrate the prototype of building broker-based model to integrate heterogeneous data grid. This work securely provides querying and managing geospatial data and services, and transparent access to the related sources under Grid and Web Service environment. The paper also describe our experiences of case study on seamless integration with Purdue TeraGrid Data by using Storage Resource Broker, which is based on the extensible data service interfaces of China Spatial Information Grid.

Keywords: spatial data achieve, inter-Grid collaboration, spatial information grid, broker model, Storage Resource Broker

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No. 260

Research on Visualization Quality Control of Electronic Map

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ABSTRACT

The realization of map functions is usually paid much more attention to than the visualization quality of map in the development of electronic map. As a result, the visualization effect of electronic map is unsatisfactory. The visualization quality of electronic map is directly related to user's understanding of geographical information and influences the application of electronic map. Along with extensive expansion and application of electronic map, visualization effect of electronic map has already become an important aspect to evaluate electronic map products. To examine the evaluation and the control techniques of electronic map visualization quality and to establish evaluation standards of electronic map visualization quality are of great significance at present. Based on the experiences in electronic map design, development of electronic map platform and professional application, the authors summarize several factors affecting visualization quality of electronic map: user interface, display capacity, visual effect, display speed, dynamic labeling, real-time display, legend and symbol design, and other aspects including temporal effect, mark effect, dynamic generalization, and dynamic projection. Combining with the practice in developing an electronic atlas system called eMapSee, the authors analyze related control techniques of visualization quality of electronic map from these aspects: friendly user interface, legibility and beauty of display effect, fast map display, real-time map display, and introduce how these techniques are used in practice.

Keywords: electronic map, visualization, visualization quality, user interface

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No. 262

Implementation of "Magnifier" Effect in Multi-Scale Display of Electronic Map

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ABSTRACT

"Magnifier" is a multi-scale display form of electronic map which can display more important areas with more details and less important areas with fewer details. In order to implement "magnifier", different part of the screen must display data of different scale, so mathematical basis, data organizing, display management all have to be improved. This paper discusses the implementation of "magnifier" on the aspects mentioned above and does some experiments.

Keywords: Electronic map, Multi-scale display, Projection of changing scale

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No. 263

Using molecular systematics and GIS-based modeling approaches for selection of potential sites to explore the desirable microbial products

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ABSTRACT

Microorganisms and their chemical products are widely used as sources to isolate many drugs. To search for novel and potential bioactive compounds from microorganisms, one approach is to acquire microbial samples from various environments. However, with random collection and selection of the microbes, it would be hard to find the desired bioactive compounds. To support the selection of the ecological habitat for collecting microorganisms in an efficient way, we proposed a computational framework using molecular systematics and GIS-based modeling approaches. The first step in this framework, molecular sequences and bioactivity profiles of microbes are used to build the phylogenetic trees, whose leaf nodes are also associated with site location. Next, the phylogenetic diversity (PD) of microbes/bioactivities among different geographic sites is estimated from the trees for the selection of interesting sites. Using microbe occurrence and geographic data from the sites of interest, GARP algorithm is applied for the prediction of species distribution in other areas. In addition, the PD values from each site are used in training data for prediction of phylogenetic diversity and bioactivity diversity in unexplored areas.

Keywords: Microorganism, Natural product, GIS, Molecular systematics, Prediction modeling, Phylogenetic diversity, Phylogenetic tree, Genetic Algorithm for Rule-set Production (GARP)

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No. 264

The Application of Mixed GA—BP Algorithm on Remote Sensing Images Classification

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ABSTRACT

In this paper, both the advantage and disadvantage of traditional Genetic Algorithm and Back Propagation Algorithm are analyzed. A mixed algorithm on combination of genetic algorithm and back propagation algorithm is adopted and it′ s network is trained by a sample of the spectrum, texture, position and geometry features of hyperspectral remote sensing images. The numerical experiment is designed to compare GA—BP algorithm with an evolutionary BP algorithm, which is trained by Levenberg—Marquart algorithm. The results proved that GA—BP algorithm is more efficient, robust and practical.

Keywords: Genetic algorithm, BP algorithm, Mixed GA—BP Algorithm, Image classification

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No. 265

Semantic Integration for Mapping the Underworld

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ABSTRACT

Utility infrastructure is vital to the daily life of modern society. As the vast majority of urban utility assets are buried underneath public roads, the need to install/repair utility assets often requires opening ground with busy traffic. Unfortunately, at present most excavation works are carried out without knowing exactly *what is where*, which causes far more street breakings than necessary. This research studies how maximum benefit can be gained from the existing knowledge of buried assets. The key challenge here is that utility data is heterogeneous, which arises due to different domain perceptions and varying data modelling practices**.** This research investigates factors which prevent utility knowledge from being fully exploited and suggests that integration techniques can be applied for reconciling semantic heterogeneity within the utility domain. In this paper we discuss the feasibility of a common utility ontology to describe underground assets, and present techniques for constructing a basic utility ontology in the form of a thesaurus. The paper also demonstrates how the utility thesaurus developed is employed as a shared ontology for mapping utility data. Experiments have been performed to evaluate the techniques proposed, and feedback from industrial partners is encouraging and shows that techniques work effectively with real world utility data.

Keywords: Urban Infrastructure, Semantic Heterogeneity, Data Integration, GIS

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No. 267

The extraction and quantitative analysis of channel junctions based on DEMs

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ABSTRACT

Channel junctions are the intersection points of different gullies in a drainage area. Base on DEM data and GIS process, an effective extraction method of channel junctions is proposed at first in this paper. Then with the definition of channel junction density being introduced, the rationality and validity that it is used to describe erosion intensity at macro-scale is explored. Meanwhile, the quantitative difference of channel junction density in the Loess Plateau in North Shaanxi Province of China is analyzed. The experiment results show that there is a strong correlation of channel junction density and gully density. Moreover, channel junction density keeps more sensitive than gully density when proper threshold values are applied at different grid resolution scales. In addition, channel junction density and the loess landform types correlate intensively, which reveals the great potential significance of channel junctions on geomorphology research. At the same time, the variations of channel junction density at different order levels in the typical watersheds are discussed. So, the research is hopeful in deepening our understanding on landform characteristics and evolutions of the Loess Plateau.

Keywords: channel junctions, channel junction density, hydrology, erosion

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No. 268

Yangzhou City Land Use Dynamic Monitoring Using Multi-temporal Remote Sensing Techniques

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ABSTRACT

Remote sensing dynamic monitoring of land use could detect the change information of land use and update the current land use map, which is important for rational utilization and scientific management of land resources. This paper focused on the technological procedure of land use dynamic monitoring using multi-temporal remote sensed data, including the process of multi-temporal remote sensed images, the information classification and information extraction from remote sensing imagery, and analysis of land use changes. Based on multi-temporal remote sensed imagery of three periods in 1954, 1998 and 2002, Yangzhou city was chosen as the study area, and extraction after classified method had been used to monitor land use changes during 1954 to 2002. While classifying, the object-oriented method was used to extract features from different temporal imagery. The extraction results showed that the residential land in Yangzhou city increased largely from 9.72 km^2 to 21.35km^2, and the arable land decreased a great deal from 23.99 km^2 to 9.64 km^2. Urban expansion was toward to east. Finally, the main driving forces were analyzed, and multivariable linear regression model was used to explore the primary and secondary forces.

Keywords: Dynamic monitoring, multi-temporal remote sensing, land use, information extraction, the driving forces

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No. 269

Research on the efficiency of the spatial information service in the P2P network

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ABSTRACT

Now most of the spatial information service applications still adopt the centralized pattern, which brings the network congestion or single point of failure to the side of center server. But the P2P technique takes away the bottleneck in data transmission exists in traditional C/S model by virtue of its multilink self-adaptive mechanism of the data transmission, which has a magnitude meaning for researches on the spatial information service delivering. As the spatial data has the characteristic of the massive volumes and client change the interesting spatial area so frequently that the spatial application efficiency is sharply decreased, the author brought forward a layered P2P architecture of the spatial data interoperation and flexible group mode in P2P network. A mechanism of the layered query queue of the oriented association and the self-adapted cache mode were introduced to adjust the peer loading and the link numbers for the reliable data capture. In this way, we can provide the each peer the rapid data transmission speed, the great data transmission reliability and the better user experience. A prototype was developed and it proved the efficiency of this P2P spatial information service framework. At last the futures of involved techniques and methods are concluded.

Keywords: WebGIS, P2P, distributed environment, spatial index, self-adapted cache, spatial information service

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No. 271

Preliminary study on cluster-based parallel GIS based on GRASS GIS

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ABSTRACT

Facing to the problems of computation and I/O intensive, resulted from the massive volume of geo-spatial data, complexity of processing algorithms or models, and the time-critical demands, the challenge that arises is how to make GIS present high performance capabilities in those applications. Thus the new direction of GIS, parallel GIS has emerged. However, the traditional researches mostly focused on the parallelization for part of GIS algorithms, litter discussed how to make the specific GIS package parallel in cluster in a holistic manner. We adopt GRASS GIS as research object, and put forward the conception of cluster-based parallel GIS. The related theory, including its computing infrastructure and software framework, as well as its corresponding parallel data structure, varies parallelization patterns, are discussed in the paper. Furthermore, the principle of the schedule algorithm which can control different types of modules within the framework is also expounded in detail. From the test in the primary system, we can conclude that it has better efficiency in some modules than traditional system.

Keywords: Cluster-Based Parallel GIS, parallel computing, GRASS GIS, cluster

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No. 272

Assessment of the implementation of Urban Construction Boundaries in Beijing City by Using Remote Sensing Data

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ABSTRACT

The urban land area has greatly increased in Beijing City since 1980s. Although the Beijing CMP (City Master Plan), one of the most important tools to direct and control urban growth, has been revised frequently over time, the planned UCBs (Urban Construction Boundaries) have been kept as a basic spatial instrument to locate urban infrastructures and to contain urban expansion, playing a similar function as their couterpart- the UGBs (Urban Growth Boundaries) in the United States. Therefore, the analysis of the effectiveness of planned UCBs can be applied to examine the implementation of CMPs in managing urban growth. The present research selects the 6th Ring Road of Beijing City as the study area. First, by using the recently publicized CMP maps, the UCBs of Beijing CMP (1981-2000) and Beijing CMP (1991-2010) are traced. Second, by analyzing the TM satellite images of 1984, 1991, and 2005, the urbanized land is distinguished from non-urbanized land. Then, through overlay analysis, the urbanized land area change inside and outside the UCBs in different time periods is analyzed, and the efficiency of UCBs in controlling urban growth is discussed. Some reasons for the success or failure of the UCB control are also suggested in conclusion.

Keywords: urban construction boundary, urban growth boundary, city master plan, land use change

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No. 273

A Data Quantity Optimization Algorithm in Terrain Visualization

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ABSTRACT

In order to ascertain appropriate data quantity in terrain visualization for some certain computers, the relationship model of FPS and data quantity has been put forward in this paper. Regarding the model, the time of a whole terrain visualization cycle is divided into two parts: data unrelated time and data related time. Based on the relationship model, a data optimization algorithm is developed, and the influences of timer error and data reading error are considered in terms of the algorithm. The algorithm is tested in a terrain visualization system developed with C++, FLTK and OpenGL. The results of experiment shows that the algorithm can evaluate and quantify computer's visualization performance, and calculate the precise triangle amount quickly, thus the rendering rate of terrain visualization system can be controlled accurately.

Keywords: Visualization of Terrain, Auto-adapted, FPS, Data Optimization

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No. 274

Research on triangle subdivision and cell search based on equilateral octahedron

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ABSTRACT

On the basis of the equilateral octahedron in the sphere, the global is recursively subdivided. With level of subdivision increasing, subdivision speed will descend markedly. So for the deeper hierarchy of subdivision, local subdivision is chosen. After the sphere is divided, to display the proper area, the correct cells should be found. So when the specific region is showed, its central cell needs to be as initial search cell to find grid cells within a certain range, and then show. Grid cells after subdivided can not achieve the ideal that the cells have the equal area and the equal shape, which affects the effect of display and the accuracy of search. Through the analysis of cell distortion, it is known that the basic attributes of cells distribute according to a certain law. With level of subdivision increasing, the changes tend to be stable which ensures the reliability of the deeper levels subdivision.

Keywords: triangle subdivision, cell search, the equilateral octahedron, discrete global grid

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No. 275

Potential application of remote sensing in monitoring informal settlements in South Africa where complimentary data does not exist

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ABSTRACT

Remotely sensed images are used for many purposes in today's world. In this paper, we explore the potential application of high resolution satellite images in extracting features and classifying urban settlements. The test area is Soweto, an urban area in the Greater Johannesburg Metropolitan area, in Gauteng, South Africa. We propose a new settlement typology for efficient classification of formal and informal settlements via QuickBird satellite images. Following on, an automated classification procedure based on the local binary pattern texture features is introduced. Using a convenience sample of 25 images, we show the feasibility of the new typology by applying it to both a manual classification procedure and an automated one. The manual classification procedure was conducted by a group of five experts who interpreted the images and classified them according to formal and informal settlements. Analysis of the results revealed an overall mean classification accuracy of 99.2% with a standard deviation of 1.79%. The automated method involved extracting tiles at random positions within the 25-sample dataset. The features extracted from these tiles were classified using a support vector machine. Classification accuracy on new samples was 56.27%, but cross-validation on the training data reached classification accuracies of 98%.

Keywords: informal settlements, planning, remote sensing, classification, QuickBird, built-up environment, South Africa

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No. 276

Contour fitting with moving surface considering sample dispersion

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ABSTRACT

Contour fitting based on moving surface is a common algorithm in map digitalization. But due to the limitation of the elevation fitting models, the elevation of grid points in the DEM may comprise systematic errors, and it is unavoidable to cause the local distortion of the generated contour. In this paper, sample dispersion factor was introduced to the elevation fitting model for the grid point in the DEM, which was related to both the number of the sampled points in the selected area around the fitting point and the distances between the sampled points. The influence of sample dispersion factor was analyzed comprehensively, and the rule for optimally selecting points was discussed. Furthermore, the steps to fit contours considering the sample dispersion factor were suggested. With simulated data collected from a standardized digital map, the precision of the generated contour considering sample dispersion factor was analyzed in detail and some beneficial conclusions were made.

Keywords: digital map, contour, moving surface, elevation fitting model, DEM, systematic error, local distortion, sample dispersion factor, sampled point, precision

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No. 277

A New Automatic Matching Method of SAR Data for DEM Extraction

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ABSTRACT

In this paper, pixel based matching methods, and the fact that registering accuracy of phase values, for their direct function in DEM extraction, has more impact on DEM results are discussed. Then the authors analyzed the disadvantages of traditional phase average gradient function method, which can be concluded as human interference required and its sensitivity to noises inducing low accuracy. To get avoid of those shortcomings, a modified phase average gradient function method was proposed in which the theory of pyramid matching was also brought in to make sure of reliability and lessen the amount of computation. Experiments are carried out and results, in the form of coherence maps, of the new method were compared with that of accuracy testified largest correlation coefficient method in existed software. And the conclusion that it can gain better results was drawn. At last, further developments that can be made in the future were discussed.

Keywords: SAR image matching, pixel information, phase average gradient function, correlation coefficient, pyramid matching.

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No. 278

BUDEM: an urban growth simulation model using CA for Beijing metropolitan area

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ABSTRACT

It is in great need of identifying the future urban form of Beijing, which faces challenges of rapid growth in urban development projects implemented in Beijing. We develop Beijing Urban Developing Model (BUDEM in short) to support urban planning and corresponding policies evaluation. BUDEM is the spatio-temporal dynamic model for simulating urban growth in Beijing metropolitan area, using cellular automata (CA) and Multi-agent system (MAS) approaches. In this phase, the computer simulation using CA in Beijing metropolitan area is conducted, which attempts to provide a premise of urban activities including different kinds of urban development projects for industrial plants, shopping facilities, houses. In the paper, concept model of BUDEM is introduced, which is established basing on prevalent urban growth theories. The method integrating logistic regression and MonoLoop is used to retrieve weights in the transition rule by MCE. After model sensibility analysis, we apply BUDEM into three aspects of urban planning practices: (1) Identifying urban growth mechanism in various historical phases since 1986; (2) Identifying urban growth policies needed to implement desired urban form (BEIJING2020), namely planned urban form; (3) Simulating urban growth scenarios of 2049 (BEIJING2049) basing on the urban form and parameter set of BEIJING2020.

Keywords: cellular automata, policy simulation, urban growth simulation, logistic regression, BUDEM, MonoLoop, desired urban form

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No. 279

Workflow-based system design for the online inspection of spatial data

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ABSTRACT

With the broadening and deepening of GIS applications, the GIS system is beginning to process a much larger amount of spatial data. Further analysis and processing of spatial data depend on data quality to a great extent, i.e. the accuracy, integrity and coherence of the data. Different methods have been developed for the purpose of controlling data quality. In this paper, a novel solution is proposed, which is a workflow-based system design for the online inspection of spatial data combined with the role-task based access control model and the versioning function of ArcSDE on a database. The design is charactered by precise workflow modeling of the online inspection of spatial data. There are two significant advantages about this design: a) A more secure access control mechanism in GIS workflow; b) A more effective solution to support long transactions of GIS workflow. This workflow-based system design has been successfully used in the active fault seismic data which have been collected from more than twenty cities in China and include different disciplines. It is charactered by stronger security and easier maintenance. Moreover, it can also be used for other kinds of online inspection of spatial data with its universal applicability.

Keywords: Workflow; GIS; Spatial data; Online inspection; Versioning; Access control

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No. 281

Spatial Data Interoperability among Multi-clients Based on Shared Database

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ABSTRACT

This paper reviews the progress of the research on spatial data interoperability and several methods currently used to achieving spatial data interoperability, puts the emphasis on analyzing the advantages, as well as the handicaps and existing conditions of interoperability based on shared database and the discrepancy of data models specific to different GIS, which is a main obstacle to spatial data interoperability, and brings forward two methods for achieving spatial data interoperability based on shared spatial database: one is realizing spatial data interoperability among different clients by using the same set of data model in database, the other is interoperability among clients through objects translation in a shared database. The paper also makes a comparison between these two methods in feasibility and difficulty of carrying out. Based on the analysis, this paper makes an experiment with Oracle Spatial in a local network using the second method, the emphasis of the experiment is put on the interoperability of oriented point objects and text, or annotation objects, as the two types of objects have no standard data model in Oracle Spatial and data models brought forward by different GIS vendor used to describe these two types of objects are specific to their GIS software. Two GIS software, MapInfo and Geomedia, are used as client in the experiment. The experiment shows that this method to achieve spatial data interoperability is practical and could be used inside an organization by employees in different departments, who are familiar with different software in their work, to obtain data sharing and interoperability. This method can also lower data redundancy and improve work efficiency.

Keywords: spatial data interoperability, shared database, OGC, Oracle Spatial, multi-clients

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No. 282

Study on the visual algorithm for JPEG-HDR remote sensing image

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ABSTRACT

Recently, JPEG High Dynamic Range (JPEG-HDR) remote sensing images have become popular in photogrammetry and remote sensing for its high brightness level. But how to reproduce and visualize such images in the standard display device becomes a question, a new tone mapping method in this paper is proposed to realize the visualization of the HDR remote sensing image. The experimental results presented in the paper demonstrate the fast and effective of our method.

Keywords: JPEG-HDR, Tone reproduction, TRC, Remote sensing image

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No. 284

Spatial analysis of heavy metals in surface soils based on GeoStatistics

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ABSTRACT

The pollution of surface soils caused by heavy metals has been a focus problem discussed. Instead of the acquisition of the "best" estimation of unsampled points, the author paid much attention to the assessment of the spatial uncertainty about unsampled values. The simulation method of Geostatistics, aimed at the same statistics (histogram, Variogram), can generate a set of equally-probable realizations which is particularly useful for assessing the uncertainty in the spatial distribution of attribute values. The case study was from an Urban – Rural transition zone of Shanghai, China. Six kinds of heavy metals (Cu, Pb, Cd, Cr, Hg and As) in agricultural surface soils were analyzed in the paper. Based on the study of spatial variation of different kind of heavy metal, the author got the different realization of the 6 kinds of heavy metals respectively based on the sequential simulation methods. At last, the author drew the conclusion that Cu, Cd and Cr were the dominant elements that influenced soil quality in the study area. At the end of the paper, the author gave the uncertainty map of the six heave metals respectively.

Keywords: Simulation, Geostatistics, spatial variability, regionalized variable, semivariogram function, Kriging, pollution, soil, heavy metals, uncertainty

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No. 285

The Measurement for High-Level and Complex Building and model in Share Property Areas

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ABSTRACT

This paper has discussed the measurement of house property areas for high-level and complex building. The conditions analysis based on building itself and surrounding construction site considered, we propose the methods of the measurement of the side length of outward wall, the coordinates in the housing corner feature points and the area calculation by total station survey. The method for area calculation with the amendment to housing corner feature points by total stations been pointed out. The analysis has been investigate to the range between the side length of the wall and the coordinates obtained through the coordinates observations of the housing corner feature points on the high-level standards or heterogeneous layer by the total station and the cumulative value measured by steel ruler or handheld range finder on each side indoor measurement, so that the accuracy of the property areas can be controlled. At the same time the determination principles and model for share property areas are discussed, two logical models are put forward.

Keywords: High-level and complex building, total station, Housing corner feature points, Coordinate amendment, the logical model in share property areas

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No. 286

A rigorous attitude estimation method for satellite attitude determination based on star sensor

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ABSTRACT

Attitude estimation method is one of influencing factors for the attitude accuracy. Traditionally, the elements of the rotation matrix as attitude unknowns are estimated optimally, but the solved attitude angles based on the elements of rotation matrix aren't optimal. A rigorous attitude estimation approach for satellite attitude determination based on star sensor is presented in this paper, which directly considers three-axis attitude angles as attitude unknowns. The experiment indicates the proposed approach can improve the attitude accuracy to a great degree when the position errors of image points are within ±0.5 pixel, and the efficiency can be guaranteed as well.

Keywords: star sensor , attitude accuracy, collinearity equation

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No. 287

Urban Traffic Safety Analysis and Assessment System Based on GIS: System Design, Key techniques and Implementation Strategy

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ABSTRACT

As the most important technical support to digital transportation and intelligent transportation system (ITS), Geographical Information System (GIS) has become an important tool for traffic safety assessment, management and accident prevention. In this paper, the key techniques, system design method and implementation strategy of Traffic Safety Analysis and Assessment System (TSAAS) is investigated based on the integration of GIS and traffic safety models. TSAAS takes road segment as basic units and uses node sets and directed edge sets to describe road network. Event driven spatial data model is adopted to organize information about traffic accidents in order to link accidents with road network data. In order to solve the problem of data storage, Microsoft SQL Server2000 is used as the basic database platform and SuperMap SDX+ large spatial database engine is used. Traffic safety analysis modeling is usually based on many random accident events, and the results are expressed by certain numerical criteria. Taking two typical traffic safety models: black point model and traffic safety assessment model as examples, the integration of traffic models with GIS is explored in detail. Finally the implementation strategy of TSAAS is investigated, and the secondary development scheme based on ComGIS product, SuperMap Objects, is recommended.

Keywords: Geographical Information System (GIS); Traffic Safety; Traffic Safety Analysis and Assessment System (TSAAS); Event-driven data model

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No. 288

Measuring transit accessibility based on disaggregate data in GIS – the case of Wuhan, China

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ABSTRACT

Various accessibility measures have been developed for evaluating transit service efficiency. The exponential or logistic type of accessibility model makes use of the phenomenon of distance decay around transit stops, in which distance is a key variable. To reflect the effect of overlapping service between adjacent stops, a weighted distance is developed. The weighted distance is the Euclidean distance weighted by accessible number of transit lines, which is derived either by the integral distance function or the inverse distance weighted interpolation. By combining disaggregated population data, the service capabilities of all bus stops are computed. The stops can be categorized based on the service capability to provide new insight for transit planning and evaluation.

Keywords: disaggregate data, distance decay, transit accessibility, integral distance, IDW

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No. 289

An integrated approach using ISODATA and SVR to land cover classification: an example of wheat

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ABSTRACT

An integrated approach of ISODATA and SVR is presented to extract the objective information, e.g. wheat, which can adequately combine the advantages of both hard and soft classification. It exploits the classification method of ISODATA for the typical objective feature and SVR mixed spectral unmixing for the mixed objective feature. The accuracy assessment shows that this method, which can obtain a higher accuracy than that of either linear spectral unmixing or ISODATA method, is practical.

Keywords: ISODATA, SVR, Land cover, Wheat

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No. 290

Extraction of Information of Targets based on Frame Buffer

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ABSTRACT

In all ways of perception, vision is the main channel of getting environmental information for intelligent virtual agent (IVA). Reality and real-time computation of behavior simulation of intelligent objects in interactive virtual environment are required. This paper proposes a new method of getting environmental information. Firstly visual images are generated by setting a second view port in the location of viewpoint of IVA, and then the target location, distance, azimuth, and other basic geometric information and semantic information can be acquired based on the images. Experiments show that the method gives full play to the performance of computer graphic hardware with simple process and higher efficiency.

Keywords: intelligent virtual agent, visual model, visual image, extraction of information

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No. 292

An Intelligent method for Geographic Web Search

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ABSTRACT

While the electronically available information in the World-Wide Web is explosively growing and thus increasing, the difficulty to find relevant information is also increasing for search engine user. In this paper we discuss how to constrain web queries geographically. A number of search queries are associated with geographical locations, either explicitly or implicitly. Accurately and effectively detecting the locations where search queries are truly about has huge potential impact on increasing search relevance, bringing better targeted search results, and improving search user satisfaction. Our approach focus on both in the way geographic information is extracted from the web and, as far as we can tell, in the way it is integrated into query processing. This paper gives an overview of a spatially aware search engine for semantic querying of web document. It also illustrates algorithms for extracting location from web documents and query requests using the location ontologies to encode and reason about formal semantics of geographic web search. Based on a real-world scenario of tourism guide search, the application of our approach shows that the geographic information retrieval can be efficiently supported.

Keywords: Geographic web search, Semantic interoperability, Ontology, GIS.

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No. 293

Measurement of Wind-induced Response of a Tall-building Using GPS

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ABSTRACT

Although accelerometers are useful in determining the dynamic properties and wind-induced resonant type responses of tall buildings, they are unable to measure static deflections and quasi-static background responses. The main objectives of the research presented in this paper are to characterize the resonant responses and slowly-varying (quasi-static) responses of a tall building with 3D mode shapes under wind excitation using GPS single epoch relative positioning technique. The calibration study presented in this paper demonstrates that GPS can be used in practice for measuring wind-induced responses of tall buildings. Results from the field monitoring system show dynamic displacements measured by GPS have a good agreement with acceleration simultaneously acquired by accelerometers in both time-domain and frequency-domain. By constructing a multipath mode, the wind-induced quasi-static deformation can be obtained, which is consistent with wind speed and wind direction simultaneously acquired by anemometer.

Keywords: GPS, measurement of displacement, wind-induced response, tall building

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No. 294

Using Clustering Methods in Geospatial Information Systems

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ABSTRACT

Spatial clustering is the process of grouping similar objects based on their distance, connectivity, or relative density in space, which has been employed for spatial analysis over years. To be able to integrate the proper clustering methods in geospatial information systems, two problems are discussed in the paper: how to select a proper spatial clustering methods and how to implement the clustering method in GIS. In this paper, we will give a detailed discussion on different types of clustering methods. Analysis on advantages and limitations for some classical clustering methods are given. Then we will discuss some issues of using the spatial clustering methods in the geospatial information systems.

Keywords: spatial clustering, clustering, spatial data mining, constrained spatial clustering, geospatial information systems (GIS)

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No. 295

An integrated GIS-based data model for multimodal urban public transportation analysis and management

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ABSTRACT

Diversity is one of the main characteristics of transportation data collected from multiple sources or formats, which can be extremely complex and disparate. Moreover, these multimodal transportation data are usually characterised by spatial and temporal properties. Multimodal transportation network data modelling involves both an engineering and research domain that has attracted the design of a number of spatio-temporal data models in the geographic information system (GIS). However, the application of these specific models to multimodal transportation network is still a challenging task. This research addresses this challenge from both integrated multimodal data organization and object-oriented modelling perspectives, that is, how a complex urban transportation network should be organized, represented and modeled appropriately when considering a multimodal point of view, and using object-oriented modelling method. We proposed an integrated GIS-based data model for multimodal urban transportation network that lays a foundation to enhance the multimodal transportation network analysis and management. This modelling method organizes and integrates multimodal transit network data, and supports multiple representations for spatio-temporal objects and relationship as both visual and graphic views. The data model is expressed by using a spatio-temporal object-oriented modelling method, i.e., the unified modelling language (UML) extended to spatial and temporal plug-in for visual languages (PVLs), which provides an essential support to the spatio-temporal data modelling for transportation GIS.

Keywords: Multimodal transportation network, United Modelling Language (UML), Plug-in for Visual Languages (PVLs), Geographical Information System for Transportation (GIS-T)

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No. 296

Integration of GIS: A showcase study on GML based WebGIS

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ABSTRACT

The growth of Geographical Information Systems (GIS) emerges as analytical decision-making tools utilizing highly specialized geographic data. However, a simple system still does not exist for the integration/sharing information among GIS. Different organizations working within various domains have built their own data models for collecting and analyzing data. Many data storage, analysis, and delivery issues have prevented these organizations from effectively sharing their data. This presentation aims to show how to share the geo referenced information by utilizing GML (Geography Markup Language) technology among heterogeneous GIS. At present, the updates are retrieved manually; often failing entirely results in information loss and major inconsistencies or referenced data set can be purchased from geographic information producers. The problems and expense associated with the integration of updates for geographic databases are documented. Moreover, a showcase study on a GML based Web-GIS application system has also been developed in order to show how to share geographic information by using GML. The application includes various coverage layers online maps, important textual information and selected case studies

Keywords: GIS, XML, GML, heritage, integration.

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No. 297

Land Use/Cover Change Detection Based on Span of Land Use Map

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ABSTRACT

Based on the analysis and summarizations of researched home and aboard, the dissertation focused on Land Use/Cover Change Detection Using Feature Database of basic types Based on Land Use span, which belongs to "Feature class" of LUCC. It should be pointed out that the researches must be focused on the land use spans other then traditional methods of the pixels.The main contributions of the study were summarized as follows:1. Feature extraction based on land use span. The land use span is expressed by vector polygon along with raster region. First the spectrum feature database with histogram, texture and shape feathers of the span is formed.2. Foundation and update of feature database. In detail, firstly, by means of the sample spans according to land use map in time T1, the features of each type of the land use classes are obtained in time T1. Secondly, each sample are analyzed, if the index of regional similarity between the image spans of T1 and T2 is accepted, the samples in time T2 could be remained, otherwise the new samples around that sample are selected and are judged by the similarity between the samples of T1. 3. Change detection based on spans and feature database. Each spans of T2 will be classified according to the minimum Euclidean distance to the T2 sample spans accepted, and the corresponding land use type will be assigned to the current span. 4. Change information is extraction automatically based on Boolean operations. After classifications have been performed, the changed spans were vectored, then the change information can be statistic through the different Boolean operations in GIS, and various change analysis can be made (i.e. urbanization and loss of the stew). The method is tested on the Quick Bird images of a district in Wuhan and the precision of the results is high as 85.7% (in loss of the stew) and 92.6% (in urbanization).

Keywords: Land use span, Sample span, Index of regional similarity, Feature extraction, wavelet transformation, Feature database, LUCC change detection

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No. 298

The Coupling Law of the Interaction between Economic Development and Eco-environment in Medium-sized City: a Case from Lianyungang City in China

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ABSTRACT

City plays a strong role in the development of national economy and society. But its high economic development speed results in big resource depletion and environmental pressure. The coupling law between economic development and eco-environment refers to the collection of all interaction non-linear relations among economic, social and eco-environmental system during the economic development course. Many large cities have been in the medium or later stage of industrialization while medium-sized cities are just in the beginning for the industrialization. For this special development period of industrialization of medium-sized city, it is a great practical significance for analyzing the coupling law of the interaction between economic development and eco-environment. In this paper, Lianyungang City was selected as the study demonstration area. 6 mathematics models for describing the quantitative relations between environment and economic development were achieved through the analysis of the relativity and quadratic and cubic equation fit and regression based on the data of environmental quality, pollutant discharge and economic development in the period of the years 1983-2006. The results showed that there exists the coupling law of the Interaction between Economic Development and Eco-environment. Through the establishment of conceptual model, the coupling law of the interaction between economic development and eco-environment in Lianyungang City was quantitatively analyzed and studied, which is helpful for the comprehensive policy-making and sustainable development in medium-sized city.

Keywords: Medium-sized City; Lianyungang City; Environmental Kuznets Curve; Coupling Law

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No. 299

Selection of Comparative Cases in Land Appraisal Based on Cloud Model and Gray Relevancy Theory

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ABSTRACT

There is a traditional approach named market comparative method, which is used to appraise land price by putting a focus on comparing cases. A review of the developing history of this method highlights some persistent challenges. In this paper, this existing approach is extended through coupling the cloud model, a data-mining technique, with gray relevancy theory. This approach allows the construction of quantitative measurement according to qualitative concept (attribute), simulating human cognizing process. This novel method admits hierarchical describing and exploration of the relationship and proximity between district factors and individual factors. By 1-D cloud generator, we obtain several rules in terms of linguistic atom which confirm the number of overlap cloud. Each rule corresponds to a rule's rear that achieves uncertainty ratiocination. In order to prove applicability of this method, it is applied to the selection of comparative cases in land appraisal of Wuhan City. Experimental results show most cases can be correctly discriminated and the better comparative cases are acceptable. Compared with other approaches, this method has better performance in land appraisal.

Keywords: cloud model, gray relevancy theory, market comparative method, land appraisal

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No. 300

Study of Spatio-Temporal data model in Parcel-alteration and Tracing of history

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ABSTRACT

Temporality is the distinct attribute of cadastral information. It is very important to scientifically and efficiently manage three kinds of data that exist in the Cadastral Information System, such as spatial data, temporal data and attributive data.Based on the research of TGIS and the advantages of existing spatio-temporal database model. This paper proposes a design of a spatio-temporal cadastral database which is divided into historical database and alterative database. This design fulfills the requirements for management of cadastral data and reduces data redundance and enhances the efficiency of database.

Keywords: spatio-temporal data model, parcel alteration, cadastral data, tracing of history

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No. 301

Network-based spatial clustering technique for exploring features in regional industry

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ABSTRACT

In the past researches, industrial cluster mainly focused on single or particular industry and less on spatial industrial structure and mutual relations. Industrial cluster could generate three kinds of spillover effects, including knowledge, labor market pooling, and input sharing. In addition, industrial cluster indeed benefits industry development. To fully control the status and characteristics of district industrial cluster can facilitate to improve the competitive ascendancy of district industry. The related researches on industrial spatial cluster were of great significance for setting up industrial policies and promoting district economic development. In this study, an improved model, GeoSOM, that combines DBSCAN (Density-Based Spatial Clustering of Applications with Noise) and SOM (Self-Organizing Map) was developed for analyzing industrial cluster. Different from former distance-based algorithm for industrial cluster, the proposed GeoSOM model can calculate spatial characteristics between firms based on DBSCAN algorithm and evaluate the similarity between firms based on SOM clustering analysis. The demonstrative data sets, the manufacturers around Taichung County in Taiwan, were analyzed for verifying the practicability of the proposed model. The analyzed results indicate that GeoSOM is suitable for evaluating spatial industrial cluster.

Keywords: SOM, DBSCAN, GeoSOM, Industrial Aggregation

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No. 302

The hexagonal discrete global grid system appropriate for remote sensing spatial data

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ABSTRACT

With the enrichment of earth observing measures, the interesting field of photogrammetry and remote sensing monitoring has expanded gradually to the whole world, traditional planar data structure no longer satisfies the global-oriented application of geo-spatial data. Breaking through the constraints of planes, managing and utilizing remote sensing spatial data in the real earth mode have now become an inevitable trend. Discrete Global Grid System (DGGS) provides new ideas for the constructing of new spatial data models. Based on the frame of DGGS, this paper designs a new hexagonal hierarchical structure of remote sensing data that has the attribute of geographical location. Compared with the traditional image rectangular quadtree structure, this structure is more applicable to the management and arrangement of global spatial data (especially the raster data) and can express and process multi-resolution global geo-spatial data seamlessly.

Keywords: Discrete Global Grid System, Encoding, Hierarchical Structure, Hexagon

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No. 303

City Positioning Method Based on Streetlight

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ABSTRACT

The relation between city positioning and people's life & production is very close. City positioning method can reflect the city's management level and the city's modernization degree. By virtue of the example of digital city management system, the author first analyzed the traditional method of city positioning, then aiming at the characteristics of streetlight which distributes regular and neatly in city, put forward the method of city positioning based on streetlight. In this paper, the author mainly discussed the streetlight's encoding method, positioning method based on streetlight and its application requests.

Keywords: city positioning, digital city management system, geocoding data, streetlight, streetlight identification code

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No. 304

Designation of a multi hazard monitoring and management system for urban areas

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ABSTRACT

This paper describes designation of an integrated system for urban disasters monitoring and management. Multi sensor application for urban hazard monitoring, can be conducted with appropriate models in GIS and internet based communication infrastructure to provide a solution for real time urban hazards contingency and emergency response. The system architect includes a module called command and control system, designed for managing and coordinating urban accidents response. Command and control system coordinates all tasks related to accident emergency response through urban hazard administration office. The structure also includes web based accident data dissemination scheme through internet portal which act as a communication system to connect accident managers in administration office with accident relief operators on the ground. All components of the system including database, central repository system, command and control system, communication system, and urban disaster models are described. This new development in geomatics application can be used for other hazards monitoring and management in the environment.

Keywords: Disaster Management, Urban planning, Decision Support System, GIS, Internet Application

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No. 305

Dynamic Change and Quantitative Analysis of Zhelin Bay Based on Multi-source spatial data

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ABSTRACT

As one of the most important aquatic products raising bases of Guangdong province in China, Zhelin Bay has experienced high intensity of exploitation and utilization during the recent decades. This paper aims at the dynamic change of Zhelin Bay, multi-source data of digital land use map, topographical map, and geomorphological map of the National Coastal Survey of china in 1980s, Landsat TM satellite imagery obtained in 2000, land use data in 2000, as well as SPOT imagery and land use data from the newly National 908 Remote Sensing Survey were used. The data were preprocessed in a uniform mathematical foundation at first. Water area rate, open degree, and morphology coefficient which can depict the change of bays in different respect were taken as quantitative indicators to analyze the morphological changes of Zhelin Bay. The classification based on these indicators was then made in each period of time. Finally, the comprehensive spatio-temporal change of the bay was evaluated in a Changing Index model. Analysis results show that, during the latest 20 years, the water area rate has changed evidently from 0.8503 to 0.7410, leading to the category of Zhelin Bay changed from entire-water bay to much-water bay. Besides, the Changing Index of Zhelin Bay during the latest 20 years is 0.44%. Reasons for the change were discussed and some suggestions were given in the end of the paper.

Keywords: multi-source data, dynamic change, quantitative analysis, Zhelin Bay, bay classification

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No. 309

Pedestrian Navigation Data Modelling for Hybrid Travel Patterns

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ABSTRACT

At present, navigation data models, such as GDF4.0, KIWI, SDAL and WI 19134, didn't pay attention to form pedestrian transport infrastructure into their models. With the development of navigation, pedestrian navigation has become a hot topic. The research team put forward their pilot research on pedestrian data modeling for hybrid travel patters, mainly including subway, bus and feet. Pedestrian road network modeling was made. Based on this, it carried out the discussion on multi-level navigation data modeling of hybrid travel patterns. It also gave algorithm suggestion to operate the optimal route computing more efficient. The future work is just to focus on demonstrate the algorithm.

Keywords: pedestrian navigation, data model, hybrid, public transport, burning algorithm

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No. 310

Simulation of Waste Gas Pollution Diffusion for Urban Planning ——Take Nanjing as an Example

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ABSTRACT

Waste gas pollution diffusion is one of the basic factors that should be considered in the layout of urban planning. In the field of Chinese urban planning, limited by the planning skill and the level of different departments' involvement, the future pollution degree and pollution range of industrial region is hard to be predicted accurately. The newly issued Urban and Rural Planning Act carry out scientific development idea, pay more attention to the proteaction of urban ecological environment in principles, and encourage the application of new technology and new methods in planning skill. This paper combines digital map information, collects industrial point source spatial data of Nanjing, selects appropriate model from the technical requirements of urban land planning, establish database of air pollution diffusion based on ArcGIS platform, calculates spatial concentration of air pollution diffusion with interpolation, and carry out superposition between 16 wind directions and value in multi-sources air pollution, puts forward the conception of effective pollution range according to national environment management system standard, and performs a preliminary spatial fitting between computing result of spatial data and urban land, evaluates the effects of waste gas pollution in Nanjing on urban land planning. Finally the research direction that can be prolonged is pointed out.

Keywords: simulation of air pollution diffusion, GIS, technique of urban planning, urban environment protection

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No. 311

Study of Forecast Simulation Technology of Water Pollution Emergencies Based on GIS

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ABSTRACT

The frequent occurrences of major water pollution emergencies in China have aroused the widespread social and governmental concerns. How to address serious water pollution is a complex task with integration of several elements. Focusing on the weakness of the mission, the paper has made comprehensive analysis of the characteristics of various water types, operation status of different pollutions. Study was made on the prediction simulation of unexpected events, and a forecast system of water pollution events was designed and established with the support of the environmental water models. The research in the paper has adapted to the environment management in the new phase and met the urgent demand in the water pollution emergencies; hence it is of practical significance.

Keywords: water pollution emergency, forecast simulation, aquatic environment model, GIS integration

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No. 313

Research on Assessment System of Flood Losses for Poyang Lake Area Based on GIS

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ABSTRACT

In order to assess flood losses accurately and rapidly, the author has developed the assessment system of flood losses for Poyang Lake area based on GIS. Firstly, the author has established the assessment model of flood losses for Poyang Lake area, which contains building flood hazard database, selecting flood hazard factors, improving neural network training model, verifying analysis, etc. Secondly, the author has designed the system structure, which includes six sub-system, water regime acquisition, flood forecasting, information inquiry, assessment of flood losses, flood scheduling and system settings. Then the assessment system of flood losses has been developed by using Visual Basic 6.0 and MATLAB in Arc Engine. Finally, the system has been applied in the Poyang Lake area, and the application result shows that the assessment system of flood losses has good feasibility and practicality.

Keywords: GIS, BP neural network, flood losses, Poyang Lake area, assessment system

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No. 315

CityGML: A Bridge between GIS and Urban Planning

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ABSTRACT

GIS shows great potential for supporting kinds of decision and management functions that lie at the heart of the planning process. However, data sharing and integration between GIS and urban planning are always problematic. This paper analyzes the root causes of the problem. Then, for finding a fundamental solution, the paper introduces an open data model-CityGML and its application in urban planning processes. As proof of concept, an initial prototype is designed to demonstrate the data sharing and integration based on CityGML.

Keywords: CityGML, GIS, urban planning

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No. 316

Extracting shelter forest in semi-arid sandy area based on Landsat ETM+ imagery

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ABSTRACT

Taking a sub-area of semi-arid west Jilin Province as example, we mainly discuss the method of shelter forest extraction in sandy area from Landsat-7 ETM+ imagery in this study. After the comparison of the image fusion methods including HIS transforms, PCA transforms, Brovey transforms and Wavelet transforms, the method of Brovey transforms improved by wavelet analysis is presented for further processing. The details information in fused ETM+ image by this improved method is more considerable and fruitful. Using unsupervised classification in combination with supervised classification and threshold method based on NDVI, we extract the farmland shelterbelts from the fusion image finally. The accuracy of classification is more than 85%. From the experiment result, this method shows a better performance in the shelter forest extraction in a typical semi-arid sandy.

Keywords: shelter forest, image fusion, Landsat ETM+, semi-arid sandy area

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No. 317

Visualization of NASA Earth Science Data in Google Earth

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ABSTRACT

Google Earth, as one of most popular geospatial data visualization environment, has been used to augment the research value of Earth science data at NASA Goddard Earth Science Data and Information Service Center. The solutions of how to use Google Earth to facilitate the sharing and interaction of geospatial data are described and summarized in this paper first. Some of solutions are applied to two-dimensional mapped data to render the data into Google Earth via Earth science-specific software and keyhole markup language. A 3D model based innovative method is proposed here to visualize and display the three-dimensional atmospheric vertical profiles derived from A-Train constellation satellites in the form of 3D orbit curtain in Google Earth. This visualization capability extends awareness and visibility of NASA Earth science data to massive Google Earth user groups, including the general public. The availability of many scientific results in Google Earth enables easy and convenient synergistic research, advancing collaborative and globalized scientific research on a virtual platform.

Keywords: Earth Science Data, Vertical Profile, Google Earth, TRMM, AIRS, MODIS, OMI, CloudSat, CALIPSO, Data Synergy, Online Visualization and Analysis.

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No. 318

Time-series network analysis of civil aviation in Japan, 1985—2005

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ABSTRACT

Due to the airline deregulation in 1985, a series of new airport developments in the 1990s and 2000s, and the reorganization of airline companies in the 2000s, Japan's air passenger transportation has been dramatically altered in the last two decades in many ways. In this paper, the authors examine how the network and flow structures of domestic air passenger transportation in Japan have geographically changed since 1985. For this purpose, passenger flow data in 1985, 1995, and 2005 were extracted from the Air Transportation Statistical Survey conducted by the Ministry of Land, Infrastructure and Transport, Japan. First, national and regional hub airports are identified via dominant flow and hub function analysis. Then the roles of the hub airports and individual connections over the network are examined with respect to their spatial and network autocorrelations. Spatial and network autocorrelations were evaluated both globally and locally using Moran's I and LISA statistics. The passenger flow data were first examined as a whole and then divided into 3 airline-based categories. Dominant flow and hub function enabled us to detect the hub airports. Structural processes of the hub-and-spoke network were confirmed in each airline through spatial autocorrelation analysis. Network autocorrelation analysis showed that all airlines ingeniously optimized their networks by connecting their routes with large numbers of passengers to other routes with large numbers of passengers, and routes with small numbers of passengers to other routes with small numbers of passengers. The effects of political events and the changes in the strategies of each airline on the whole networks were strongly reflected in the results of this study.

Keywords: airline networks, Japan, dominant flow, hub function, spatial autocorrelation, network autocorrelation

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No. 319

Feature extraction and scale analysis based on Quickbird image using object-oriented approach

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ABSTRACT

Information extraction from high-resolution remote sensing image automatically has been attracting wide audience globally nowadays. Traditional pixel-based classification for remote sensing image with high spatial resolution is out need of precision. Considering of the characteristic of remote sensing, object-oriented approach gives the resolution. Taking Quickbird image as an example, we extract some typical urban targets from the image using object-oriented image analysis in this study. The most suitable scale of image segmentation is also discussed. We also evaluate the classification precision in associated with different segmentation scale. Result shows that object-oriented approach has a great deal of advantage such as high precision, high efficiency, convenience and so on. When the segmentation scale is defined between 15 and 20, we will get the best classification result. Extracting at the most suitable scale of image segmentation, the precision of classification can reach above 90 percent.

Keywords: Feature extraction, segmentation scale, Quickbird image, object-oriented image analysis

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No. 320

The Design and Implementation of 2D Vector Graphics Interactive Tools Based on "Smart Handle"

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ABSTRACT

This article summarizes several kinds of interactive tasks and tools in 2D vector graphic system, analyses an ordinary design idea for interactive tool. We find that it is difficult to find a point of balance between user experience and code's maintainability and extensibility. So we present a design idea for smart handle-based interactive tool. Handles are usually expressed as rectangles or circles when graphic-cells are selected. Smart handle is a concept proposed in this paper. Compared with the handle, smart handle knows how to operate its own graphic-cell. So a complicated interactive task is assigned to every smart handle. It proves that this is a better solution to solve a contradiction between user experience and code's maintainability and extensibility.

Keywords: Handle, Interactive tasks, Interactive tools, 2D vector graphics system

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No. 321

The Architecture of a Virtual Grid GIS Server

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ABSTRACT

The grid computing technology provides the service oriented architecture for distributed applications. The virtual Grid GIS server is the distributed and interoperable enterprise application GIS architecture running in the grid environment, which integrates heterogeneous GIS platforms. All sorts of legacy GIS platforms join the grid as members of GIS virtual organization. Based on Microkernel we design the ESB and portal GIS service layer, which compose Microkernel GIS. Through web portals, portal GIS services and mediation of service bus, following the principle of SoC, we separate business logic from implementing logic. Microkernel GIS greatly reduces the coupling degree between applications and GIS platforms. The enterprise applications are independent of certain GIS platforms, and making the application developers to pay attention to the business logic. Via configuration and orchestration of a set of fine-grained services, the system creates GIS Business, which acts as a whole WebGIS request when activated. In this way, the system satisfies a business workflow directly and simply, with little or no new code.

Keywords: Grid GIS; SOA; SoC; ESB; Microkernel; Integration

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No. 322

Research of image preprocessing methods for EO-1 Hyperion hyperspectral data in tidal flat area

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ABSTRACT

With the advantage of image-spectrum integration and quantitative analysis, space-borne hyperspectral remote sensing technique was increasingly applied in ground object identification and information extraction at coastal region to solve the difficulty for field observation and sampling. In order to deeply excavate the embedded spectral information for different features in coastal area, the preprocessing process of hyperspectral image was essential and necessary. So taking Hyperion hyperspectral image as example dataset, the objective of this article is to study and build a doable flowchart for Hyperion image preprocessing to get the reflectance image of coastal region for further study and use. The processes include: (1) bad lines fixing; (2) vertical stripes removing; (3) atmospheric correction; (4) geometric correction and (5) tidal flat area separation from vegetation and water body. Related algorithms and parameters were also discussed in detail.

Keywords: Coastal region, Hyperion, hyperspectral, image preprocessing

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No. 324

Effective visibility analysis method in virtual geographic environment

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ABSTRACT

Visibility analysis in virtual geographic environment has broad applications in many aspects in social life. But in practical use it is urged to improve the efficiency and accuracy, as well as to consider human vision restriction. The paper firstly introduces a high-efficient 3D data modeling method, which generates and organizes 3D data model using R-tree and LOD techniques. Then a new visibility algorithm which can realize real-time viewshed calculation considering the shelter of DEM and 3D building models and some restrictions of human eye to the viewshed generation. Finally an experiment is conducted to prove the visibility analysis calculation quickly and accurately which can meet the demand of digital city applications.

Keywords: visibility analysis, sightline, DEM, 3D data model

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No. 325

A formal model describing topological relations between spatial linear objects in GIS-T

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ABSTRACT

The importance of studying topological relations between spatial linear objects is expounded. The concepts endpoint, interior, exterior and boundary of spatial linear object are defined on the basis of basic theories of point-set topology, and a formal and perfect model describing topological relations between spatial linear objects is proposed based on that. Fifteen negative rules are putted forward to exclude the impossible topological relations which are described by the model according to the realistic physical meaning of spatial linear objects. The smallest set of topological relations between spatial line objects is proposed, and the exclusivity and perfectibility of the smallest set are proved.

Keywords: Topological relation, 16-intersection model, point set topology, spatial linear object

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No. 329

Urban transportation of Beijing in a fast expansion based on the resident satisfaction survey

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ABSTRACT

This study examines the satisfaction degree of the transportation convenient level by the questionnaire survey and the spatial characteristics by the method of spatial autocorrelation in order to reveal the transportation problems as a consequence of rapid urban development in the city of Beijing. The results demonstrated that the satisfaction degree of traffic congestion was the lowest and the satisfaction degree of transportation convenient level in suburb was lower than it in central city. The supply of traffic facilities, the pattern of resident traffic mode, the road system organization, and the land-use type in a fast expansion were the important causes. According to the research, three major reasons of urban expansion issues are detected. The first reason is lack of comprehensive development planning mechanism to associate the land use with urban transit system which resulted in the lack of transportation facilities. Secondly, Beijing's ring-road structure cannot afford rapid traffic growth and become a main reason to cause traffic congestion. Thirdly, land-use type is deep cause of transportation problems. This study also gave some suggestion in order to minimize the negative aspects: "control" and "regulation" are the two ways to solve the traffic problem; urban spatial expansion oriented by the public transportation and service is the efficient pattern of spatial expansion.

Keywords: Urban transportation; Questionnaire survey; Spatial autocorrelation; Beijing

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No. 330

Design research about coastal zone planning and management information system based on GIS and database technologies

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ABSTRACT

As littoral areas in possession of concentrated population, abundant resources, developed industry and active economy, the coastal areas are bound to become the forward positions and supported regions for marine exploitation. In the 21st century, the pressure that coastal zones are faced with is as follows: growth of population and urbanization, rise of sea level and coastal erosion, shortage of freshwater resource and deterioration of water resource, and degradation of fishery resource and so on. So the resources of coastal zones should be programmed and used reasonably for the sustainable development of economy and environment. This paper proposes a design research on the construction of coastal zone planning and management information system based on GIS and database technologies. According to this system, the planning results of coastal zones could be queried and displayed expediently through the system interface. It is concluded that the integrated application of GIS and database technologies provides a new modern method for the management of coastal zone resources, and makes it possible to ensure the rational development and utilization of the coastal zone resources, along with the sustainable development of economy and environment.

Keywords: coastal zone, Geographic Information System, database, planning and management information system

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No. 331

Using Level of Detail for Underway Path Finding Solution

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ABSTRACT

The booming development of the city and urban area made the transportation more and more complex. People even need a guidance to help them go from one place to another. The incoming huge needs of path finding can't be only fulfilled by providing more computing resource and improving path finding algorithms yet. New methods for providing the routing solution are also needed to be considered carefully. This paper represents a concept to introduce Level-of-Detail technology for path finding process to reduce the algorithm's computing resource consumption, and increase the algorithm's efficiency.

Keywords: Level of Detail, path finding, A* algorithm, region

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No. 332

Trends and Driving Mechanism of Land-use Change of City Circle at the Pearl River Delta

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ABSTRACT

Taking Pearl River Delta for example, this study focuses on the trends and the driving mechanism of land-use changes in metropolis, in order to achieve the fundamental objectives of LUCC study —— depending awareness on dynamics of global land use and land cover changes, and improving the ability of forecasting LUCC. Analyze on land-use change in Pearl River Delta and it can show notable differences among internal space. Establish time- sequence –curve by SPSS software and it can show evident trends of land-use change. With factor analysis on land-use change, the study summarizes four factors of driving mechanism, including factors of economic development level, regional industrial structure, demographic and agricultural structure adjustment, which impact land change in Pearl River Delta to a different extend.

Keywords: LUCC, driving mechanism, trend, city circle at the pearl delta

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No. 333

Building Simplification Algorithms Based on User Cognition in Mobile Environment

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ABSTRACT

With the development of LBS, mobile map should adaptively satisfy the cognitive requirement of user. User cognition in mobile environment is much more objective oriented and also seem to be a heavier burden than the user in static environment. The holistic idea and methods of map generalization can not fully suitable for the mobile map. This paper took the building simplification in habitation generalization as example, analyzed the characteristic of user cognition in mobile environment and the basic rules of building simplification, collected and studied the state-of-the-art of algorithms of building simplification in the static and mobile environment, put forward the idea of hierarchical building simplification based on user cognition. This paper took Hunan road business district of Nanjing as test area and took the building data with shapfile format of ESRI as test data and realized the simplification algorithm. The method took user as center, calculated the distance between user and the building which will be simplified and took the distance as the basis for choosing different simplification algorithm for different spaces. This contribution aimed to hierarchically present the building in different level of detail by real-time simplification.

Keywords: Building simplification, generalization, cognition

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No. 335

Modeling the impact of urbanization on infectious disease transmission in developing countries: A case study in Changchun City, China

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ABSTRACT

This paper presents an integrated model to model the effects of urbanization on infectious disease transmission by coupling a cellular automata (CA) land use development model, population projection matrix model and CA epidemic model. The improvement of this model lies in using an improved CA epidemic model that can divide individuals into three states (susceptible, infected and recovered) and combine connection factor, movement factor into the epidemic model to provide more helpful outcomes in infectious disease transmission. A population density surface model and a household density surface were used to bridge the gap between urbanization and infectious disease transmission. A case study is presented involving modelling infectious disease transmission in Changchun City, a rapidly urbanizing city in China. The simulation results for Changchun City over a 30-year period show that the average numbers of susceptible individuals, infected individuals and recovered individuals in the latter time are greater than those in the previous time during the process of urbanization. In addition, the average numbers of susceptible individuals, infected individuals and recovered individuals increase with higher population growth rate.

Keywords: developing countries, infectious disease transmission, urbanization, CA land use development model, population projection matrix model, CA epidemic model

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No. 336

The carbon reduction research of teaching staff commuting aided by Google earth --taking Guangzhou University as an example

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ABSTRACT

In this paper, taking Guangzhou University as an example, carbon reduction of teaching staff commuting was researched. Firstly, considering carbon emission of teaching staff commuting is come from the fuel consumption of vehicle used to trip, the routes, schedule, vehicle type, fuel type and fuel consumption per 100 km of service express bus, public bus and private car were investigated from relevant department and web questionnaire in office automation system. Secondly, the routes of service express bus, public bus and private car were drawn in Google earth browser to measure distance. Thirdly, combined the bus schedule, school calendar, curriculum timetable of teacher and fuel consumption per 100 km of all kinds of vehicle, the fuel consumption of service express bus, public bus and private car were computed. Fourthly, carbon emission was calculated according to net calorific factor and calorie carbon emission factors of fuel. Finally, the measures of carbon reduction were discussed. The research results show that teaching staff commuting emitted 455.433 tons carbon in 2005-2006 academic year. And reducing usage rate of private car and adding new service express bus line are efficient measure of carbon reduction. Former measure can reduce 33.6891 tons carbon and about 7.4% of original emission. The latter can reduce 7.6317 tons and about 1.68% of original emission.

Keywords: Carbon emission, Carbon reduction, Commuting, Remote sensing, Google earth

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No. 337

A Two-level Image Pair Simulator for Interferometric Synthetic Aperture Radar

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ABSTRACT

This paper presents a novel simulator to obtain single-look complex (SLC) image pair from the distributed target for interferometric synthetic aperture radar (InSAR). From conventional works, two simulation levels are derived: one is raw signal level (RSL) which means using raw signal to obtain SLC image pairs, the other is SLC image level (SIL) which means obtaining the SLC image pairs directly from existing SAR images. Conventional simulators only work on one simulation level, use complicated backscattering models, have high computational load on RSL and mismatch the real data on SIL. The novel simulator can robustly work on both RSL and SIL. It not only simplified the backscattering model, but also reduces the computational load on RSL. Moreover, the novel simulator creatively uses complex backscattering coefficient (CBC) pair to generate SLC image pair on SIL, which makes the result more accurately match real data. Finally, the improvements of this novel simulator are demonstrated by experimental results.

Keywords: interferometric synthetic aperture radar, SLC image, simulator, backscattering model

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No. 338

An Evaluation of Classification Methods for Level II Land-Cover Categories in Ohio

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ABSTRACT

The purpose of this research was to evaluate six classifiers applied to Landsat-7 data for accuracy of Level II land-cover categories in Ohio. These methods consist of (1) USGS National Land Cover Data; (2) the spectral angle mapper; (3) the maximum likelihood classifier; (4) the maximum likelihood classifier with texture analysis; (5) a recently introduced hybrid artificial neural network; (6) and a recently introduced modified image segmentation and object-oriented processing classifier. The segmentation object-oriented processing (SOOP) classifier outperformed all others with an overall accuracy of 93.8% and Kappa Coefficient of 0.93. SOOP was the only classifier to have by-class producer and user accuracies of 90% or higher for all land-cover categories. A modified artificial neural network (ANN) classifier had the second highest overall accuracy of 87.6% and Kappa of 0.85. The four remaining classifiers had overall accuracies less than 85%. The SOOP classifier was applied to Landsat-7 data to perform a level II land-cover classification for the state of Ohio.

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No. 339

Web-based hydrological modeling system for flood forecasting and risk mapping

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ABSTRACT

Mechanism of flood forecasting is a complex system, which involves precipitation, drainage characterizes, land use/cover types, ground water and runoff discharge. The application of flood forecasting model require the efficient management of large spatial and temporal datasets, which involves data acquisition, storage, pre-processing and manipulation, analysis and display of model results. The extensive datasets usually involve multiple organizations, but no single organization can collect and maintain all the multidisciplinary data. The possible usage of the available datasets remains limited primarily because of the difficulty associated with combining data from diverse and distributed data sources. Difficulty in linking data, analysis tools and model is one of the barriers to be overcome in developing real-time flood forecasting and risk prediction system. The current revolution in technology and online availability of spatial data, particularly, with the construction of Canadian Geospatial Data Infrastructure (CGDI), a lot of spatial data and information can be accessed in real-time from distributed sources over the Internet to facilitate Canadians' need for information sharing in support of decision-making. This has resulted in research studies demonstrating the suitability of the web as a medium for implementation of flood forecasting and flood risk prediction. Web-based hydrological modeling system can provide the framework within which spatially distributed real-time data accessed remotely to prepare model input files, model calculation and evaluate model results for flood forecasting and flood risk prediction. This paper will develop a prototype web-base hydrological modeling system for on-line flood forecasting and risk mapping in the Oak Ridges Moraine (ORM) area, southern Ontario, Canada, integrating information retrieval, analysis and model analysis for near real time river runoff prediction, flood frequency prediction, flood risk and flood inundation area prediction.

Keywords: Web-based Decision Support System, hydrological model, river runoff prediction, food forecasting

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No. 340

Application and key techniques of multi-wavelength lidar

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ABSTRACT

In this paper a new technique of objects measurement based on multi-wavelength lidar system has been proposed and developed to make horizontal-path laser measurements of objects. The two or more wavelengths laser transmitter operates within and adjacent to the sensitive bands exhibited by the characteristics of each object, the result could be used to establish inversion models of the laser transmitting backscatter signals. The application value and the key techniques of the spectral lidar are analyzed. The lidar wavelength selection method is studied and a hyperspectral experiment had been down to testify the feasibility of the theory. Also issues to approach the final goal of this new technique are discussed.

Keywords: Lidar, wavelength selection, remote sensing

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No. 341

Towards a 2D Vector Map with a Feature Nodes Based Watermarking method

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ABSTRACT

With a wide use of vector maps, the copyright issue is educing an increasing importance and attracting focus on the transmission and the exchange of the vector maps through a network environment. This paper discusses a feature nodes based watermarking method (FNBW) towards keeping robustness and high accuracy of digital map based on SVG and GML format. The digital map treats as a set of curves in the embedding algorithm, and each curve was divided up into several shorter curves under two given thresholds. And then a watermark bit combined with user certificate was embedded into each segment around the feature nodes with the maximum curvature in the segment series nodes. To extract the watermark, all watermark nodes were calculated and searched for in the watermarked map with the Watermark node Searching Algorithm by using the original map. Finally the method calculates the similarity between the original watermark bits and the extracted ones, and determines whether the watermark exists or not. As the experiment result shown, the method not only guarantees the accuracy of vector map but also possesses the good robustness, such as it gives 1.00 similarity under no attack or only geometric transformation with the map; And the anti-copping ability is also good enough to give a more than 0.87 similarity for the map cropped 80%. In addition, the method has the full ability of anti-compression lossless methods and good ability to the loss approaches. And an experiment curve of the similarity threshold was given in the paper, which helped to control the anti-attack ability of the watermark and set parameters for an automatic procedure of watermark detection.

Keywords: Vector map, digital watermark, robustness, similarity, feature nodes

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No. 344

On Defining Structured Geometry Types in PostgreSQL to Implement a Spatial Database

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ABSTRACT

PostgreSQL is a widely used open source object-relational database system, on which the PostGIS spatial database is built. By defining geometry types in PostgreSQL according to the OGC WKB standard, geographic features are usually defined as a base type which is stored as general binary data blocks without internal structures. But the unstructured representation of the structured geometry data model brings the problem of inefficient data access. In this paper, we propose a new approach that uses an array of structured composite types to replace the unstructured base types to store geometry types. Then PostgreSQL 8.3 is extended to support spatial data management in this proposed approach following the standard of OGC's Simple Feature Specification. A contrastive experiment proves the advantages and efficiency of this method.

Keywords: ORDB, PostgreSQL, Composition Type, Spatial Database, Spatial Data

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No. 345

Stereo Image Pair's Construction and Accuracy Analysis based on MMT Soft-baseline

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ABSTRACT

Land based mobile mapping technology (MMT) can collect spatial and attribute data in high efficiency and the data can meet the requirement of 1:2000 scale or even higher accuracy topographic mapping without ground control point. In mobile mapping, direct georeferencing by the integration of GPS and INS/DR provides the mobile platform's continuous position and pose to mapping sensor in field survey, then image stereo of the certain target is used to calculate its 3d global coordinates. But in general, current MMT image stereo is defined as the solid baseline between the different CCD cameras' relative position deviation which is rigid connected to each other and calibrated by high precise control field, and baseline length is quite short (less than 2 meters). This brings some troubles on the far distance target or big size building observation from different viewpoints, and also limits the use of huge amount of MMT measurable images. This paper presented the image stereo pair construction in soft-baseline condition, which is organized through the different imaging time and platform field place but overlapped to the certain target, thus the baseline's accuracy would be some obvious lower than the solid one. We made a brief introduction about Tongji Geo-Informatics MMT firstly, analyzed the image stereo pair from the solid-baseline, and then constructed MMT measurable image into soft-baseline stereo and due mathematical model is expressed. In the paper's experiment part, we analyzed the concrete target 3d solution with the total station, MMT image's solid-baseline stereo and the soft-baseline surveying. The calculation shows that the target 3d coordinates solution in soft-baseline has the same precision as the solid one, also meets the topographic mapping requirement of scale 1:2000. Last, the paper discussed some important influence from the change of angle of two observing bundles in photogrammetric forward intersection and the change sub-deviations of survey error vector in image space coordinate system. As conclusion, MMT soft-baseline brings more choice with target survey in the larger observing distance and good coordinate solution with the measurable MMT images.

Keywords: Land based mobile mapping, image stereo construction, solid- and soft-baseline, photogrammetry forward intersection

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No. 346

Rural tourism spatial distribution based on multi-criteria decision analysis and GIS

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ABSTRACT

To study spatial distribution of rural tourism can provide scientific decision basis for developing rural economics. Traditional ways of tourism spatial distribution have some limitations in quantifying priority locations of tourism development on small units. They can only produce the overall tourism distribution locations and whether locations are suitable to tourism development simply while the tourism develop ranking with different decision objectives should be considered. This paper presents a way to find ranking of location of rural tourism development in spatial by integrating multi-criteria decision analysis (MCDA) and geography information system (GIS). In order to develop country economics with inconvenient transportation, undeveloped economy and better tourism resource, these locations should be firstly develop rural tourism. Based on this objective, the tourism develop priority utility of each town is calculated with MCDA and GIS. Towns which should be first develop rural tourism can be selected with higher tourism develop priority utility. The method is used to find ranking of location of rural tourism in Ningbo City successfully. The result shows that MCDA is an effective way for distribution rural tourism in spatial based on special decision objectives and rural tourism can promote economic development.

Keywords: rural tourism; spatial distribution; MCDA; GIS

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No. 347

Dynamic Transition Rules for Geographical Cellular Automata

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ABSTRACT

There is rapid development of CA models for simulation of land use patterns and urban systems recently. Traditional models use the uniform transition rules in large areas or at long times. These models have limitations because they use the same factors and weights in different places or times while these factors and weights vary spatially. This paper presents the method of using dynamic transition rules for producing more reliable urban simulation. The advantages of dynamic transition rules are apparent in this paper. First, it uses different factors and weights in different regions which are consistent with actual urban systems. Second, the main factors can be obtained from the dynamic transition rules in different regions which may produce different urban development patterns. Based on the stepwise logistical regression model, dynamic transition rules were obtained for simulating the evolution of the urban systems in five towns of the Dongguan city from 1988 to 2004. Compared with the general CA model, the simulation precision is improved by using this method. From the factors and weights of dynamic transition rules, three kinds of development patterns were obtained: center development pattern, road development pattern and center-road development pattern.

Keywords: cellular automata; dynamic transition rules; stepwise logistical regression; urban system

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No. 348

Ontology-based Geographic Information Semantic Metadata Integration

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ABSTRACT

Metadata is important to facilitate data sharing among Geospatial Information Communities in distributed environment. For unanimous understanding and standard production of metadata annotations, metadata specifications are documented such as Geographic Information Metadata Standard (ISO19115-2003), the Content Standard for Digital Geospatial Metadata (CSDGM), and so on. Though these specifications provide frameworks for description of geographic data, there are two problems which embarrass sufficiently data sharing. One problem is that specifications are lack of domain-specific semantics. Another problem is that specifications can not always solve semantic heterogeneities. To solve the former problem, an ontology-based geographic information metadata extension framework is proposed which can incorporate domain-specific semantics. Besides, for solving the later problem, metadata integration mechanism based on the proposed extension is studied. In this paper, integration of metadata is realized through integration of ontologies. So integration of ontologies is also discussed. By ontology-based geographic information semantic metadata integration, sharing of geographic data is realized more efficiently.

Keywords: Geographic information, Metadata, Integration, Ontology, Semantic

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No. 349

Quantification analysis of 3D urban form based on GIS——a case study of Nanjing downtown

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ABSTRACT

An approach to describe 3D urban form is proposed in this study. Central part of Nanjing is taken as study site.Firstly, quantitative attributes are proposed from urban geometry and its function, and they are compactness, elevation range, volume expansibility, diversity, dominance. Then, all the attributes are derived and spatial distributions are analyzed to reveal relationship between attributes and some geographical features. The result shows that the above five attributes closely correlate with land use; especially compactness, diversity and dominance reflect the feature of building configuration. Finally, a multi-spectrum image is produced by the optimal combination of attributes to classify urban form. The result shows that different blocks of different land use can be distinguished. This research reveals the spatial distribution of urban form properties and their relationships between some geographical features. This quantification analysis of #d urban form is a new way to study urban form from three-dimensional aspect.

Keywords: quantification, urban form, three-dimensional, Urban DEM, GIS

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No. 350

Distinguishing the impacts of land use and arid process on natural potential productivity of cultivated land in the North Farming - Pastoral Zone of China

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ABSTRACT

The paper distinguished the impacts of land use and arid process on the Natural Potential Productivity of Cultivated Land (NPPCL) in the North Farming - Pastoral Zone of China (NFPZC) from 1990 to 2000 with the integration of remote sensing technique and Geographical Information System (GIS). The arid processes in NFPZC from 1970 to 2006 were analyzed. The land use processes from 1990 to 2000 were investigated. The NPPCL in NFPZC from 1990 to 2000 were calculated by using the Thornthwaite-Memorial model. And finally the influences of land use and arid process on the NPPCL in NFPZC from 1995 to 2007 were distinguished by using the powerful spatial analysis function of GIS. The main results were as follows: (1) In spite of some climate variation, it still had an obvious arid process in the NFPZC during the past three decades. Such arid process made the NPPCL in the NFPZC decrease 16.61 million tons from 1990 to 1995 and 19.55 million tons from 1995 to 2000. (2) From 1990 to 2000, cultivated land in NFPZC changed intensively. It expanded from 231907 km2 in 1990 to 238032 km2 in 1995 and 244109 km2 in 2000. Such land use process caused the NPPCL in the NFPZC increase 5.36 million tons from 1990 to 1995 and 4.48 million tons from 1995 to 2000. (3) Influenced simultaneously by land use and arid process, NPPCL also changed obviously in NFPZC from 1990 to 2000 with 11.24 million tons decrease during 1990 and 1995 and 15.08 million tons decrease during 1995 and 2000 respectively. Spatially, the NPPCL is sensitive to arid process in the Northwest area of NFPZC, governed by Shanxi province, Gansu province and Ningxia autonomous region. While in the Northeast area of NFPZC governed by Hebei province and Shanxi provinces, land use play the dominate role to influence NPPCL. It suggested that the impacts of both the cultivated land loss and the climate change on cultivated land productivity should be simultaneously concerned to avoid food problems in China.

Keywords: land use, arid process, Natural Potential Productivity of Cultivated Land (NPPCL), the North Farming - Pastoral Zone of China (NFPZC)

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No. 351

Fuzzy Set Theory Based Model for Simulating Land Use Change

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ABSTRACT

The land use change is a progressive and non-deterministic process both spatially and temporally. In dealing with this relatively complicated spatial phenomenon, the Fuzzy Set theory could be employed to represent and handle the spatial uncertainty in the two-dimension continuous space. This study thus combines this theory with the shape interpolation technique to simulate the change of land use across space over time. Specifically, the Fuzzy Set theory is used for producing a set of intermediate fuzzy layers of geographic features based on two existing ultimate layers. Here the fuzzy membership functions are constructed by a statistic method related to the theory of probability. With a given space-time resolution, the utilization of shape interpolation is aimed at determining the particular location of a geographic entity. Using Nantong City of Jiangsu Province as a case study, the transition progress from non-urban area to urban area between 2001 and 2006 is empirically implemented. The research results are obtained in accordance the realistic situation of urban growth in Nantong City.

Keywords: fuzzy set theory, interpolation, urban area, transition

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No. 352

Design and implementation of GML applied technology services framework

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ABSTRACT

As an XML-Based markup language, Geography Markup Language (GML) is a tool of storing, modeling, transferring, and exchanging for spatial data interoperability. More business organizations and researchers apply themselves to researches on GML applied technologies. However, after the analysis of these research results, we find that the interoperability of these research results has become a limitation in the development of GML applied technology. After analyzing OGC Web Service (OWS) framework and Web Services protocols related, this paper designs and implements a GML Applied Technology Service Framework (GATSF) to solve the interoperability problem mentioned above .In the end, this paper gives an example of prototype system whose system functions are created through the integration of services in GATSF.

Key words: GML, GML applied technology, interoperability, web service

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No. 353

Design of an extended qualitative cardinal direction relation model based on ontology

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ABSTRACT

Cardinal direction relation is an important spatial relation to determine directions and locations between spatial objects. Since 1987, some corn-based and projection-based direction relation models have been proposed. However, these existing models use different terms and methods to describe and represent direction relation, so it is difficult to share information in application systems. In order to support cardinal direction relation representing and reasoning according to explicit different level of details and improve the information reusing and interoperability, it is necessary to have explicit formalizations of mental concepts that people have about it. In this paper, we use ontology to set up a higher level of abstraction where the more valuable information about the meaning of the direction relation can be handled, and propose an extended qualitative description and reasoning cardinal direction model, which precisely describes cardinal direction relations between objects by separating the reference objects as point, line and area. This model has been implemented based on geo-ontology, and it can support common direction relation applications in spatial reasoning domain.

Keywords: spatial relations, cardinal directions, direction relation matrix, ontology

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No. 355

A Flexible Integration Framework for Semantic Geospatial Web Application

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ABSTRACT

With the growth of the World Wide Web technologies, the access to and use of geospatial information changed in the past decade radically. Previously, the data processed by a GIS as well as its methods had resided locally and contained information that was sufficiently unambiguous in the respective information community. Now, both data and methods may be retrieved and combined from anywhere in the world, escaping their local contexts. The last few years have seen a growing interest in the field of semantic geospatial web. With the development of semantic web technologies, we have seen the possibility of solving the heterogeneity/interoperation problem in the GIS community. The semantic geospatial web application can support a wide variety of tasks including data integration, interoperability, knowledge reuse, spatial reasoning and many others. This paper proposes a flexible framework called GeoSWF (short for Geospatial Semantic Web Framework), which supports the semantic integration of the distributed and heterogeneous geospatial information resources and also supports the semantic query and spatial relationship reasoning. We design the architecture of GeoSWF by extending the MVC Pattern. The GeoSWF use the geo-2007.owl proposed by W3C as the reference ontology of the geospatial information and design different application ontologies according to the situation of heterogeneous geospatial information resources. A Geospatial Ontology Creating Algorithm (GOCA) is designed for convert the geospatial information to the ontology instances represented by RDF/OWL. On the top of these ontology instances, the GeoSWF carry out the semantic reasoning by the rule set stored in the knowledge base to generate new system query. The query result will be ranking by ordering the Euclidean distance of each ontology instances. At last, the paper gives the conclusion and future work.

Keywords: spatial information, semantic geospatial web, RDF, OWL, ontology

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No. 357

Agent-based Modeling and Simulation for Pedestrian Movement Behaviors in Space: a review of applications and GIS issues

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ABSTRACT

Agent-based approach has the advantage of supporting researches on local dynamics of pedestrian movement at a fine scale. After discussing the categories of environment and pedestrian behaviors, this paper reviews the recent development of diverse applications of agent-based pedestrian modeling and simulation under the four headings: (1) transportation planning for pedestrian facilities, (2) planning and design of urban space, (3) crowding, evacuation/panic, and disaster management, and (4) commercial activity organization and shopping behavior. The proposed various models and simulation systems in most of the applications are still immature and not suitable for practical decision-making. The last section of the paper discusses the relationship between GIS and agent-based pedestrian models and simulation systems, and stresses the enhancement of such models and simulations by incorporating more spatial query and analysis functionalities of GIS.

Keywords: Agent-based approach, pedestrian model, behavior, GIS

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No. 358

The Design and Implementation of a Remote Sensing Image Processing system Based on Grid Middleware

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ABSTRACT

In this article, a remote sensing image processing system is established to carry out the significant scientific problem that processing and distributing the mass earth-observed data quantitatively and intelligently with high efficiency under the Condor Environment. This system includes the submitting of the long-distantly task, the Grid middleware in the mass image processing and the quick distribution of the remote-sensing images, etc. A conclusion can be gained from the application of this system based on Grid environment. It proves to be an effective way to solve the present problem of fast processing, quick distribution and sharing of the mass remote-sensing images.

Keyword: Condor; Remote sensing image; Task; Module; Web Service; Fast; Grid Middleware

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No. 359

GridGIS Portal Development based on OGCE

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ABSTRACT

GridGIS is the application of grid computing technology on GIS field, which aims to realize the spatial information sharing and cooperative service. However, current grid technologies are generally difficult to use, so the development and deployment of Web portals that simplifies usage of grid resources has become popular. Grid-enabled portals can thus serve as simple, single points of entry or gateway to multiple computing resources, providing access to complex grid tools and services. In this paper, we give an overview of GridGIS project and the key role of that GridGIS portal is playing in reaching its goals. Then, we describe the portal and Open Grid Computing Environment (OGCE) portal toolkit. Basing on OGCE and integrated Open Geospatial Consortium (OGC) Web service, we design the architecture of the GridGIS portal. In an open source development environment, we develop and deploy GridGIS portal, which includes authentication module, Grid Port Information Repository (GPIR) portlet, Comprehensive File Management (CFM) portlet, Grid Resource Allocation and Management (GRAM) portlet and Map Viewer portlet.

Keywords: GridGIS, portal, OGCE, OGC, GPIR, CFM, GRAM

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No. 360

Comparison Research of Algorithms about Ortho-rectification for Remote Sensing Image

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ABSTRACT

There are kinds of methods for ortho-rectification in application of remote sensing, including Collinearity Equation Model, Strict Geometric Model based on Affine Transformation, Improved Polynomial Model, Rational Function Model, Method based on Neural Network, and so on. But there is lack of system comparison between these methods. On the basis of detailing the algorithm of these methods above, advantages and drawbacks about these algorithms are summarized in this paper. Specific emphasis is the mathematical derivation and algorithm of RFM. Two kinds of algorithm based on neural network were taken in application of ortho-rectification. To compare accuracy and effective between the above methods, we also detailed the processing steps and make some experiments. The result shows that: in the condition of the same GCPs distribution, Rational Function Model that can reach sub pixel accuracy is the best of all from the viewpoint of precision, which can be used in practice in spite of its relatively slower speed.

Keywords: Remote Sensing, Image, Ortho-rectification

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No. 362

Geostatistical analysis of soil organic carbon in the farming-pastoral ecotone of Northeast China

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ABSTRACT

In this paper, a total of 191 topsoil samples were taken in Tongyu County, a typical area of farming-pastoral ecotone in the Northeast China, and soil organic carbon (SOC) concentrations were investigated using statistics, geostatistics and GIS techniques. Mean concentration of SOC in surface soil of Tongyu County was 0.76%, which was a very low level. The coefficient of variation (C_v) (0.23) indicated the moderate variability of SOC. Significant positive correlations existed between SOC and total N, total P, available N, silt, clay, respectively; negative correlations between SOC and sand, SOC and elevation were observed. The linear regression model of SOC was built based on other soil properties in order to comparing with interpolation results. To obtain an unbiased assessment on the spatial structure of SOC, the spatial outliers were detected using local Moran's I index. The parameters of experimental model fitted for the dataset excluded spatial outliers were better than those for all samples, but the difference was not significant at the regional scale. Based on Kriging interpolation, the spatial distribution of SOC showed a broad regional pattern, with higher values in the eastern part, and lower values in the middle and western part. This spatial pattern was mainly controlled by structural factors, such as climate, parent material and topography.

Keywords: Soil organic carbon, geostatistics, correlations, farming-pastoral ecotone, Tongyu County

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No. 363

Combination of CALIPSO and Geographic Information to analysis the aerosol type in different location and acquire the atmospheric parameter

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ABSTRACT

Space borne LIDAR is a fire-new method for aerosol observations, it help us to acquire the global data on the structures and optical properties of aerosols. In this paper, a lidar ratio selection algorithm is introduced, since lidar ratio (the aerosol extinction-to-backscatter ratio, S_a) is an important parameter for aerosol retrieval. Then we use an appropriate retrieval algorithm for signals which is observed by a space borne backscatter lidar, after inversion the distribution state of aerosol optical depth can be obtained. The distribution of aerosol optical depth is not only related to the earth's surface and the geographic location of the aerosol emission, but also related to other meteorological factor. Such as turbulent, wind gusts, hurricanes, tornadoes, and land clearing and development activities, all of these cause aerosol drift from initial geographic location.From summer to autumn, the changing characteristic of aerosol optical depth in Central Southern China is analyzed by retrieving the space borne lidar signal. On a short term, through analyze the aerosol distribution, whether or how atmospheric motion influences on aerosol particle diffusion is available.

Keywords: CALIPSO, aerosol, lidar ratio, lidar

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No. 365

Acquiring height distribution information about high-rises in Beijing using shadow in SPOT-5

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ABSTRACT

Shadow in panchromatic band of some high spatial resolution remotely-sensed data can be worked at building height information extraction. This paper introduced an operational method to undertake height distribution information extraction using SPOT-5 panchromatic and multi-spectral data. Whether such a method is feasible and sensibilities of result to some influential factors are analyzed. Then, the method is applied to process SPOT -5 data of Beijing in year 2004 and 2007. Height distribution result shows that high-rise building within Chaoyang District contributes a lot to height growing of the whole city.

Keywords: shadow, length calculation, high-rise, Beijing, CBD

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No. 366

Analysis of relationship between pedestrian facilities and urban morphology based on visibility

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ABSTRACT

Pedestrian are one main component in urban space, and it's they that influence and determine urban layout. Spatial visibility analysis is a novel method in urban morphology and spatial configuration. Spatial visibility analysis in urban morphology mainly studies on spatial features (street network for instance) in the city configuration and visibility with humans in it. Through building the visibility of urban space, we can predict pedestrians flow movement trends to analyze the spatial modes. We hypothesis individuals move on street network and change their ways of movement at road crosses with viewshed directions. We can apply the isovist or viewshed to direct their behaviors, and we can analyze the distribution of pedestrian flows potentially. In urban planning, the distribution of facility locations must be consistent with pedestrian flows, and we can offer the estimate through the approach above. The paper first discusses the principle of pedestrian behaviors based on viewshed and the concepts of visibility centricity, then quantifies the parameters of visibility analysis on viewpoints to explore urban morphology of street network of WUHAN ZHONGNAN district. We extract the viewpoints with higher value and draw their distribution map. At the same time we survey the pedestrian facilities locations in city. This paper reveals the consistent relationship between them and demonstrates the influences of geometric features on pedestrian facilities locations over metropolitan's areas based one visibility analysis.

Keywords*:* Visibility Analysis, Space Syntax, Urban Morphology

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No. 367

A GIS Based Estimation of Loss of Particulate Nitrogen and Phosphorus in Typical Drainage Area of Pearl River Delta

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ABSTRACT

The output of nitrogen and phosphorus from agricultural activities is the main source for water eutrophication. The fully developed agriculture in vegetables, fruits and flowers in Pearl River Delta gives rise to excessive use of chemical matter such as fertilizer and pesticide and thus bring about the serious water pollution because of the loss of nitrogen (N) and phosphorus (P) from the farmland in the region. Based on Geographic Information System (GIS) and soil pollution data, Universal Soil Loss Equation (USLE) and source type method are used to estimate the loads of particulate N and P from the soil of different land use types in the drainage area of Liuxi River in Guangzhou, China. So the key regions those the NPS pollution occurred can be confirmed and the technical support for the pollution control target and the capital flow concentration can be provided by the results. The study shows that, (1) The total loss of particulate N and P in the drainage area is 582.49 t/a and 424.74 t/a respectively. Among them the loss of particulate N from paddy soil occupies 40.02% and that of forest 6.31%, while the loss of particulate P from the soil of dry-land accounts for 28.75% and that of paddy soil 26.31%. (2) There are significantly different losses of particulate N and P per unit area from the soils of different source land use types in the drainage area. The losses of particulate N and P per unit area are both the highest from the soil of dry-land, which is 7.72 kg/hm2 and 9.50 kg/hm2 respectively, followed by those of orchard, which is 7.20 kg/hm2 and 6.56 kg/hm2 respectively. The causes are excessive use of chemical matter, unreasonable cultivation pattern, and the soil erosion of different land use. (3) The excessive N and P come from the loss of particulate N and P from the fertilization in agricultural production, and they are the main source of the pollutants in Liuxi River water.

Keywords: Non-point Source Pollution; Loss of Particulate Nitrogen and Phosphors; Liuxi River; Pearl River Delta

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No. 369

Discussion on remote-sensing information processing service based on uniform semantic model

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ABSTRACT

With the rapid increase of remote-sensing information data, remote-sensing information processing becomes more important and complicated. However, the processing methods used lead to low processing speed, and make it difficult to realize resource sharing and mutual operation. Web Services technology can promote research into rapid processing and share of the remote-sensing data in a heterogeneous environment, so it can help to solve this problem. The existing problem is that descriptions of the service lack of well-defined semantic information and reasoning ability, so the computer can't understand the rich information from the network. Based on the situation mentioned above, this article puts forward a uniform semantic model to solve this kind of problem.

Keywords: remote-sensing information processing service, classification of remote-sensing information processing service, ontology, uniform semantic model

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No. 370

Application of GIS technology in monitoring and warning system for crop diseases and insect pests

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ABSTRACT

By researching and analyzing the crop diseases and insect pests, we find the distribution and spread of crop diseases and insect pests have tight touch with the time and space information, which provides a premise of applying geography information system (GIS) and spatial interpolation technology especially. By considering the particularity of spatial interpolation on the plant diseases and insect pests in agriculture, the authors bring forward one new method: multi-factors spatial interpolation model. It is made up of many factors, such as spatial orientation relationship, topological relationship, distance relationship and national weather conditions so on. Then, on the basis of building the multi-factors spatial interpolation model, the monitor and warning system of crop diseases and insect pests is constructed by using GIS technology and ArcIMS software. The basic functions, such as map visualization, information query, data input, data management, spatial interpolation, are implemented. What's more, by using the multi-factors spatial interpolation model, the effluence and spread speed of crop diseases and insect pests are showed and the monitoring and early-warning of crop diseases and insect pests is implemented.

Keywords: GIS, spatial interpolation, early-warning

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No. 371

Assessing the regional ecological security: methodology and a case study for the Western Jilin Province, China

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ABSTRACT

Ecological security can be investigated in both broad sense and narrow sense. Because of the wide area and regional discrepancy in influencing factors and ecological background, the investigation on regional environment hasn't been done systematically. Assessment on regional security in fragile region is important content of sustainable development. The western Jilin Province lines in the semi-arid agro-pastoral interweaving belt (APIB), within which agriculture and animal husbandry interplay or frequently alternate with each other. Study on the regional ecological security of this region offer the scientific support for protecting the regional environment and sustainability. This article set up the Pressure-State-Response model according to the interaction between human and environmental system, and assessed the ecological safety degree in the western part of Jilin Province in year 2000, using compound model and Grid method based on GIS and RS. The Ecological Security Index (ESI) was calculated by multilayer synthesis with liner weighting function method, which divided the area into the following five different conditions: highly damaged, moderately damaged, early stages of damage, relative safely, and safety, regarding change of environmental key point as the threshold value that varied under the stress of human activity. The results show that eco-environment in study area is at medial level. The early stage of damage and relative safely level occupies the largest area proportion accounting for 68.61%. Furthermore, the condition in the eastern part is better than that of the western part and the most serious degradation is found in the middle part of the study area. When talking about the ten counties in the region, highly damaged area accounts for a very small percentage. The county that has the widest area of relatively secured area is Qian'an, and that of the smallest is Da'an. The areas of highly damaged area in Tongyu, Zhenlai and Da'an have exceeded 10 % and they become the region requiring urgent treatment. Regarding average security condition, sequence of the regions from the best to the worest is as follows: Qian'an, Qianguo, Zhenglai, Songyuan City, Changling, Baicheng City, Fuyu, Taonan, Da'an and Tongyu. In this study we also analysis the relationship between ESI and landuse change from 1980 to 2000 in order to find an improving method from landscape. The studying shows that decreasing of grassland is most import factor influencing the condition of the western Jilin province.

Keywords: Regional ecological security, Pressure-State-Response model, multilayer synthesis method, western Jilin province, China

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No. 372

The Urban Expansion Trends in Nanjing City Based on RS and GIS

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ABSTRACT

With the acceleration of the Chinese urbanization, the problems between social economy and environment are increasingly serious, and the contradiction between men and land is even more evident. Therefore, how will the urban land growth in cities tend to change? How can we use urban land in an appropriate way? These have become hot topics among many scientific fields. In this paper, we take Nanjing city as an example, using remote sensing and GIS technology to reveal the spatial-temporal dynamics of urban expansion. According to the specific development stages of Nanjing, we classify the whole period into two phases which are 1988-1997, and 1997-2001, and use TM remote sensing images for the years 1988, 1997, 2001 as the basic data sources. In order to obtain the dynamic characteristics of urban land use, we divide the land use type into three types, which are urban land, watershed and green lands through Supervised Classification method. In this study, we use annual changing rate and the urban land expansion index to understand the urban expansion of each region in Nanjing city. Finally, we provide some suggestions to keep the urban land sustainable.

Keywords: RS, GIS, Supervised Classification, Annual Changing Rate, Urban Land Expansion Index

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No. 373

GIS-Based Epidemical Disease Information Visualization

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ABSTRACT

In recent epidemical researches based on GIS, a great deal of studies focus on the data analysis and result deduction using spatial-temporal analysis, scientific visualization, etc. However, there are rare researches on information visualization of various epidemical diseases. This paper studied information visualization of epidemical disease attributes, distribution, and statistics based on GIS, designed a multi-scale and population-based epidemical spreading model by considering the influence of real geographical and demographic information, and implemented its information visualization. The epidemical influence of population immigration is also considered. This model is based on the traditional SEIRS model, and could be applied to the real epidemical spreading simulation on the basis of real epidemical, geographical, social, and demographic data.

Keywords: Epidemiology, GIS, epidemical spreading, SEIRS model, population immigration, modeling, simulation, information visualization

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No. 374

3D GIS Spatial Operation Based on Extended Euler Operators

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ABSTRACT

The implementation of 3 dimensions spatial operations, based on certain data structure, has a lack of universality and is not able to treat with non-manifold cases, at present. ISO/DIS 19107 standard just presents the definition of Boolean operators and set operators for topological relationship query, and OGC GeoXACML gives formal definitions for several set functions without implementation detail. Aiming at these problems, based mathematical foundation on cell complex theory, supported by non-manifold data structure and using relevant research in the field of non-manifold geometry modeling for reference, firstly, this paper according to non-manifold Euler-Poincaré formula constructs 6 extended Euler operators and inverse operators to carry out creating, updating and deleting 3D spatial elements, as well as several pairs of supplementary Euler operators to convenient for implementing advanced functions. Secondly, we change topological element operation sequence of Boolean operation and set operation as well as set functions defined in GeoXACML into combination of extended Euler operators, which separates the upper functions and lower data structure. Lastly, we develop underground 3D GIS prototype system, in which practicability and credibility of extended Euler operators faced to 3D GIS presented by this paper are validated.

Keywords: 3D GIS, Euler operators, spatial operation, set operation, topology operation, non-manifold, underground space, OGC, ISO/TC211

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No. 376

The Water Withdraws and Spectral Characteristica Nalysis of Back Groundsurface Features In Zengcheng City

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ABSTRACT

Many achievements in studies of extracting water have been made in the past ten years.According to the foundation of remote sensing and spectrum theory, the general extracting principal of remote sensing information is introduced. Zengcheng was rich in water resources ,and it is an idel back garden of Guangzhou city. Therefore,it is important to use the water resources rationally in Zengcheng.TM image dated 10 November 2006 was elected in this paper.Both interpreted maps were analyzed and managed by ENVI and ArcGIS software.Single-band threshold method, the relationship between spectrum, vegetation index and water index method were used in this paper.At last, Water index method was considered to be the most suitable one after a comparative analysis.In this paper landscape types within the study area were classified into (1) farmland , (2)forest land, (3)urban Inhabitant land and other land ,(4)orchard land, (5)unused land , (6)water ,with the help of Land cover map 2006 of Zengcheng. A reconnaissance survey of the study area was made to correlate the image characteristics and ground features by the standard technique of human-computer 'dialogue' interpretation.According to the foundation of remote sensing and spectrum theory, a model of water body extraction is set up in this paper.

Keywords: Water Body Identification, TM, Zengcheng, NDWI

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No. 378

Application of Linear Reference System and Dynamic Segmentation in the GIS-T

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ABSTRACT

Geographic Information System for Transportation (GIS-T) is an integrated technology of GIS and Transportation, which deals mainly with linear features-only have one set of attribute. Linear Reference System (LRS) is a one-dimensional system. An unknown linear feature can be expressed directly according to the known linear features' position information and those relatively position relationship of each other without x, y coordinates. It is an intuitive way to associate multiple sets of attributes to portions of linear features. Dynamic Segmentation (DS) segments the route dynamically, and storages the attributes of all the routes in an unattached table (event table). Combining Linear Reference System with Dynamic Segmentation in GIS-T, which is more convenient to query, display and analyze the linear feature's attributes.

Keywords: Geographic Information System for Transportation (GIS-T), Linear Reference Systems (LRS), Dynamic Segmentation (DS), query, display and analyze.

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No. 380

The Construction of CNL Rules in Mobile GIS

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ABSTRACT

Natural language has been considered as one of the most habitual and effective ways of human-computer interaction (HCI). This paper proposes the constrained principles in the perspective of mobile GIS nature language, and it also restricts understanding of natural language in the domain of the specific application in mobile GIS. For implementing the interaction between mobile GIS and users with nature language, we should establish the grammar rules and the understanding method of these rules in the view of system control and spatial information inquiry. We use speech technology and mobile GIS to carry human-computer interaction out in order to achieve a friendlier, more intelligent, and easier operated way for the visit of user and the expression of information. It can promote mobile GIS to a state which is more intelligent and socialized and also improve its degree of practicality.

Keywords: Mobile GIS, constrained natural language (CNL), speech, human-computer interaction

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No. 381

Management and Services for Large-scale Virtual 3D Urban Model Data Based on Network

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ABSTRACT

The buildings in modern city are complex and diverse, and the quantity is huge. These bring very big challenge for constructing 3D GIS under network circumstance and eventually realizing the Digital Earth. After analyzed the characteristic of network service about massive 3D urban building model data, this paper focuses on the organization and management of spatial data and the network services strategy, proposes a progressive network transmission schema based on the spatial resolution and the component elements of 3D building model data. Next, this paper put forward multistage-link three-dimensional spatial data organization model and encoding method of spatial index based on fully level quadtree structure. Then, a virtual earth platform, called GeoGlobe, was developed using above theory. Experimental results show that above 3D spatial data management model and service theory can availably provide network services for large-scale 3D urban model data. The application results and user experience good.

Keywords: Mass data management, progressive transmission, 3D GIS, 3D model, spatial index, real-time network services

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No. 382

Design and Implementation of Urban Management GIS Based on Grid Technology

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ABSTRACT

With the development and expansion of city, there are many problems in city management. For example: the information is not timely, the duty of many departments is unclear, the effective supervision and appraising mechanism is shortage and so on. In order to solve the problems, the urban management GIS are designed and constructed, the grid technology is applied to urban management GIS, the basis data model for urban infrastructural facilities is constructed, the method for dividing the urban grid is researched, the components and events of facilities are coded, the manage processes are rebuilt, and then the software for grid management is designed and implemented. The authors take the grid construction of Guangzhou city as an example to represent the system tentative plan.

Keywords: grid, urban spatial information grid, GIS, urban management

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No. 383

A "Raster: Relation - Vector: Entity" Integrated Approach for Spatial Geographic Feature Retrieve

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ABSTRACT

Since vector approach can be applied for accurate geo-processing, while raster approach is suitable for spatial analysis, the integration of raster and vector approaches has been studied for years. For spatial analysis, data mining or other geo-processing, it is often necessary to retrieve the entities in GIS databases frequently. However, due to lacking of the description of spatial relations among the entities in current studies, these retrievals are severely time-consuming. This paper is to promote an integrated approach for geographic feature retrieve in a mechanism called "raster: relation-vector: entity" method concerning both the process speed and information maintenance. Firstly, a "dimension-plus" relational raster is designed for keeping all the identity information of the original spatial object based on object-oriented data model. "dimension-plus" means one more dimension is employed to store more information. Then scanning technique is developed for detecting the relations of the spatial objects in this new raster. Topological information is observed in a foreseeable raster index time. Finally topological information is transferred to vector organization and complex geometric objects can be reconstructed using vector data with minimal time consumption. This research realizes the recognition and the rebuild of spatial entities that are described in spatial shape, layer identity and the individual characteristics (e.g. color and style) of each entity in the map of .dwg format, both of the geometric information and semantic information are kept well in the retrieve process.

Keywords: Raster Matrix; Vector; Object Identity; Feature Retrieve; GIS

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No. 384

Variation of Seagrass Distribution in Sanya Bay impacted by Land Use Change

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ABSTRACT

The area of seagrass distribution in Sanya bay reduced greatly in recent years. In order to make clear the reason of seagrass decline, the relationship between seagrass distribution and land use change in Sanya Bay was retrieved in the paper, Landsat TM and ETM^+ data of 1991, 1999, in situ observation of seagrass distribution and water chemical indexes were used to retrieve the information of land use change, seagrass distribution and water quality status in Sanya bay. From the satellite images, area of eastern and western Sanya Rivers reduced in 1999 compared with that in 1991. Seashore land use change detection showed that the shape of costal line at the northeast of Lu Huitou peninsular changed greatly. Corresponding to land use change, the area of seagrass distribution in Sanya bay decreased, from distributed in the great part of south coast in 1991 to less than 1 hectare in southwest coast of Sanya bay in 1999. The effect of land use change on seagrass distribution can be concluded as following: seagrass distribution in Sanya area conversely correlated with land use change, the more area of land use change the less coverage of seagrass distribution. Mainly because of land use change changed the water quality and sediment type.

Keywords: seagrass, land use change, Sanya bay, Landsat TM

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No. 385

Research in a Chinese Word Segmentation Method based on Spatial Information Query of GIS

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ABSTRACT

Spatial information query is one of the most fundamental applications in GIS. Spatial information query based on Chinese means making a query in forms of Chinese language. Word segmentation is the first step in the process of query understanding. With the help of related searching method to extract the characteristic words from the input sentence, we can segment it into several parts for further analyzing, and then map them to a subset of spatial information database and feed back the result to the user. This thesis tries to improve the study of Chinese spatial information query and proposes a word segmentation method based on a set of characteristic words. The method rearranges the query sentence according to the given patterns and abandons the irrelevant words. Moreover, when meeting the wrong object names or unknown ones, it will amend or insert them into the dynamic library automatically. Such word segmentation method not only takes away the identification of irrelevant words but improves its efficiency of spatial information query and makes for the following mapping to the spatial database.

Keywords: Spatial information, human-computer interaction, language understanding, constrained natural language

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No. 387

Building Extraction of Urban Area from High Resolution Remotely Sensed Panchromatic Data of Urban Area

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ABSTRACT

With the recent availability of commercial high resolution remote sensing panchromatic imagery from sensors such as IKONOS and QUICKBIRD, it is possible to extract individual objects such as buildings from the imagery. However, traditional extraction methods cannot get the desired accuracy, because knowledge is not utilized. In this paper, we put forward a texture-based approach to get building information from the panchromatic imagery. Firstly, the image is segmented based on texture of variogram feature. Building corner structure knowledge is also combined to detect and connect building edges. Then we fill interiors of buildings through seed filling algorithm. In the final stage, point noises and linear noises are eliminated from the imagery through area or shape index value. The accuracy assessment adopted in this paper is GIS overlay analysis, which shows that 93.9% of building information is extracted correctly. The result indicates that the approach supplies another new technique for interpreting high spatial resolution remotely sensed imagery.

Keywords: building extraction, edge connection, texture-based segmentation, panchromatic imagery

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No. 388

Routing Algorithm Analysis of the Distributed Virtual Geographic Environment Oriented P2P Network

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ABSTRACT

Distributed Virtual Geographic Environment (DVGE) faces some challenges and problems including the factor of the mass data of VGE, the band width of network, the numerous requests and economic factors, etc. These problems directly cause the current DVGE could not provide the public with high-quality service under current network mode. Hence, this paper brings forth a research on large-scale peer-to-peer network extension of DVGE as well as a deep study on network framework and the routing algorithm of it. Finally, we conduct a simulation of the DVGE based on the routing algorithm.

Keywords: Distributed Virtual Geographic Environment (DVGE), Peer-to-Peer Network, Routing Algorithm, Spatial Data.

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No. 389

A Spatial Information Crawler for OpenGIS WFS

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ABSTRACT

The growth of the internet makes it non-trivial to search for the accuracy information efficiently. Topical crawler, which is aiming at a certain area, attracts more and more intention now because it can help people to find out what they need. Furthermore, with the OpenGIS WFS (Web Feature Service) Specification developed by OGC (Open GIS Consortium), much more geospatial data providers adopt this protocol to publish their data on the internet. In this case, a crawler which is aiming at the WFS servers can help people to find the geospatial data from WFS servers. In this paper, we propose a prototype system of a WFS crawler based on the OpenGIS WFS Specification. The crawler architecture, working principles, and detailed function of each component are introduced. This crawler is capable of discovering WFS servers dynamically, saving and updating the service contents of the servers. The data collect by the crawler can be supported to a geospatial data search engine as its data source.

Keywords: web crawler, search engine, WFS, OpenGIS, geospatial information

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No. 390

Land Use Suitability Evaluation based on GIS and Matter-element Model

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ABSTRACT

The study uses matter-element model to carry out the theory and practice research of land use suitability evaluation. First, the study sets up the matter-element model for the land use suitability evaluation. The Evaluation steps are the following: (1) select the various factors sets of land use suitability evaluation. (2) Identify the sutra fields and controlled fields of various factors. (3) Make sure the actual value of assessment unit. (4) Calculate the relating degree. (5) Evaluate the suitability levels of land use types. Using the group AHP method, the weights of the evaluation units are decided. Using the overlay space analysis method, the value of various factors is made certain. Then, the paper takes Sanhe city of Hebei province as an example to make the empirical study supported by ArcGIS. There are 153 evaluation unit in Sanhe city. The study results show that: the matter-element model can overcome the impact of human factors in the process of land use suitability evaluation to improve the assessment accuracy and operability. The agriculture and construction suitability evaluation results reflect the actual situation in Sanhe City.

Key words: land use suitability evaluation, matter-element Model, GIS

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Geoinformatics'2008; Guangzhou, China, 28-29 June 2008

No. 392

A method for matching Chinese place-name data

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ABSTRACT

Conversion and sharing of spatial data from different departments is an essential part of information construction in China. The first step of the solution is to match place-name data. However, there are administrative changes in some places with the development of urbanization process. It undoubtedly increases the difficulty to match place-name data. In the daily work, the data are artificially matched with available place-name database and materials such as graphs and record cards. Although it is easy to put in practice, this method may cost a lot of time and labor to keep the accuracy. The algorithms for matching strings can be used to solve the problem. But most of them focus on solving the English strings match problems and less refer to Chinese. In the paper, BPM-BM (Bit-Parallel Matrix -Boyer Moore) algorithm, the most efficient filter method for approximate string matching of Chinese text, is proposed to match place-names between the national surveillance sites of infectious diseases and the 1:1, 000, 000 scale township map of China in 2000. The study indicated that the proposed method decreased artificial process greatly and the accuracy which achieved 94.2% was higher than the SQL commands method.

Keywords: Place-name, cartology, edit distance, Chinese, approximate string matching, bit-parallelism, filtering, BPM, BPM-BM, SQL commands, .

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No. 395

A study on multi-agent spatial database update mechanism based on Wiki idea

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ABSTRACT

Spatial database update is a matter of urgency, which will become the "bottleneck" to GIS application instead of spatial data production. Hence it has become a focus in GIS research fields. This paper outlines the current spatial database update modes and discusses some related practical issues. In order to shorten spatial database update period and improve the intelligence level of system, an incremental spatial database update mechanism was proposed by using the cooperative work characteristic of Wiki idea and the multi-agent technology in artificial intelligence research field. Emphasis is placed on the construction of spatial database update mechanism. Special resolve method, mechanism elements and data update process are presented in detail. As a practical application, we implement a basic farmland management information system. The results show that this multi-agent spatial database update mechanism based Wiki idea can arouse the interaction of users, shorten the period of spatial data update, improve the use value of data and make the spatial database update more convenient and flexible. So, we suggest that this mechanism can provide reference to help solving the problem of spatial data update.

Keywords: spatial database, update, Wiki idea, multi-agent

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No. 396

Research on the Slope-landscape TUPU in northern Shaanxi Loess Plateau

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ABSTRACT

Slope spectrum is a statistic model of slope distribution in a certain area. Previous researches display a potential importance of the slope spectrum in geomorphological studies. To quantitatively depict the slope spectrum, three indices (H, T_d, S) were proposed, which can appropriately depict quantity features of slope distribution, but are difficult in depicting spatial structure of slope distribution. Hence, this paper suggests slope-landscape TUPU to quantitatively depict the spatial structure of slope distribution. The slope-landscape TUPU take each test area as an independent landscape unit, and the slope class as patches constituting the landscape. So, theory and methodology of landscape ecology are applied to describe the spatial structure of slope distribution directly. Results show that the slope-landscape TUPU is capable of depicting spatial structure of slope spectrum. A continuous changes of the slope-landscape TUPU from south to north of the Loess Plateau shows an obvious spatial variation of surface roughness in the area, which is proved to be of great significance in describing the surface roughness. This research also suggests relationship between digital terrain analysis and landscape ecology.

Keywords: Loess Plateau, slope spectrum, landscape, slope-landscape TUPU

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No. 397

Research on Custom-built Generation of GIS Application Software Based on Metadata

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ABSTRACT

In order to decrease the workload of code development, and to support the reuse of common functions and customization of personal functions, the paper proposes custom-built generation platform of GIS application software based on metadata. The platform divides the GIS application software into three parts: user interface, business logic and functional model. The three parts are loosely coupled based on metadata. The design of multi-layers loosely coupling indicates the system flexibility. It allows users to customize user interface, function and data to meet their personal demands. The platform locates resources rapidly based on metadata, and then customizes the GIS application software including basic GIS functions, personal user interface and flexible data. For validating the platform, the urban geologic survey information system is generated by the platform as a test. The result shows that the platform achieves the hot-plug of extensional components by modifying metadata and provides good reuse of GIS functions. Further more, it hides the diversity of GIS components. It simplifies the development of GIS application software and improves the efficiency of development.

Keywords: metadata, GIS application software, dynamic assembly, custom-built development, system flexibility, component hot-plug, loosely coupling

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No. 398

Land use change and its driving forces in Beijing during 1996-2006

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ABSTRACT

With significant socioeconomic development and increasing population, land use change is the crucial land management issue in Beijing. The new characteristics of land use change during 1996-2006 and its driving forces in Beijing were analyzed by land use surveying data, which was more accurate and can reflect the real content about land use than remote sensing images. In order to investigate the quantitative information, the direction and spatial pattern of land use change, the transition matrix, landscape metrics and centroid model are chosen in this paper. The study indicates: 1) The land use types of Beijing converted frequently. The area of cropland and grassland lost evidently; much of them converted into residential and industrial land. 2) The number of patches increased rapidly in Beijing during these years. Most land use types had the fragment tendency except for traffic land and residential and industrial land. 3) Centroid model represented the spatial expansion of the cropland and residential and industrial land. The study proposed that increasing population and developing economy were the main driving forces of land use change in Beijing these years.

Keywords: land use change, transition matrix, landscape metrics, centroid model, Beijing

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No. 399

A New Remote-Sensed Image Fusion Using Wavelet Packet Transform with the Best Basis

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ABSTRACT

In the process of remote-sensed image fusion with wavelet packet transform, wavelet basis with different properties can exhibit different fusion performance. It is significant to find the best wavelet packet basis and apply it in the process. However, for image fusion, best basis searching algorithm must works within two wavelet packet trees, in the case that the present algorithm only works within one tree. The paper firstly proposes a new searching algorithm working in two trees, then realizes a new image fusion method using wavelet packet transform with the best basis that is developed from the new algorithm. Experiment testifies: under the fusion rule based on texture, the method develops more advantage of wavelet packet transform, and gains a better fusion performance compared with other image fusion method using wavelet packet transform (including wavelet transform).

Keywords: image fusion, wavelet packet, wavelet packet transform, best wavelet packet basis

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No. 402

Satellite Image Processing and Analyzing for Marine Oil Spills

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ABSTRACT

Oil spills are seriously affecting marine ecosystem and cause political and scientific concern. In order to implement an emergency in case of oil spills, it is necessary to monitor oil spill using remote sensing. Techniques for monitoring oil spills includes optical, microwave, and radar approaches using aircraft or satellites. However, Satellites have wider coverage and lower price. Recent years, with more sensors launching, correctness and real time of oil spills monitoring using satellites are improved. Based on many successful experiences in oil spills monitoring, sensitivities of different bands to different oil types are analyzed using AVHRR and TM data, and methodologies to extract oil spills information, especial oil thickness, are presented. In addition, with regard to requirements of customers, position, area, drifting trajectory and velocity can be calculated, which supports marine oil spill fast emergency response effectively. It is believed that it is possible to establish an oil spill monitoring network using satellite covering main sea area in China.

Keywords: oil spills, remote sensing, AVHRR, TM

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No. 403

The application study of OWL reasoning based on ontology for digital urban planning

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ABSTRACT

The rising of semantic Web technology has advanced the development of ontology technology. Ontology as the foundation of semantic Web has exerted many significant role in knowledge expression and knowledge reasoning. After introducing OWL language, ontology and ontology reasoning, this paper constructed spatial ontology in digital urban planning and ontology reasoning system based on OWL then has finished relative reasoning experiment through applying this system. The experiment result indicated that spatial ontology that based on OWL not only extended the relations between classes and attributes, also improved the capability of inquire and reasoning.

Keywords: Ontology; Ontology Reasoning; Web Ontology Language (OWL); Digital Urban Planning

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No. 405

Land Use Change Pattern of Analysis Based on Landscape Ecology in Nanhai District of Foshan City

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ABSTRACT

Land use is an important field in the global environment change. This paper, taking Luocun town of NanHai District of Foshan city as an example, with the help of GIS technology, mathematics model and landscape-ecology theory, analyses the landscape pattern's changes of land-use from different region scales and different levels(the whole luocun Town and every village in luocun Town). The study shows that the fragmentation level increased. The edge degree and the PD are increased, and the landscape contagion indexes increased, but the LPI decreased. It suggests that the fragment degree and the separate degree are increased constantly. The landscape evenness index is increased, which suggests that the area of land-use patch class approach to equality. The change of the landscape pattern takes on district diversity, in the mainly, which can be cured up two different area (the eastern area and the western area). The villages in the east have a high land-use index all the time, and they have a low extent during 1987-2002; but the villages in the west have a high extent during1987-2002, the landscape diversity index and landscape evenness index are increased, the land-use develop to the diversity and at the same time, the land-use develop to the evenness, also.

Keywords: landscape-ecology, land-use, GIS

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No. 406

The semantic parsing for GML based on SIDB

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ABSTRACT

GML data is widely used for model building, data exchanging, etc. The GML data parsing is the base of handling other operation of GML. The parsing technology of XML can be used for GML parsing. But the XML parsing technology is deficient in parsing semantic information on geography information. This paper tries to build a semantic information database (SIDB) of GML and design GML core schema-based parsing engine which based on SIDB. Ultimately actualize GML data parsing. The results of the study are verified by GML test data in the paper. And more, this study provides a new way to parsing semantic information in other fields.

Keywords: XML, GML, semantic database, Xerces, schema, parsing

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No. 407

The Research on Structure and Development of the Digital Earth Prototype System

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ABSTRACT

Digital Earth (DE) is a virtual presentation of the planet based on geographic coordinate, and is an information system with tremendous amount of multiple resolutions and multiple scales data as shown in multiple dimensions. Since the exact description about DE has not completed, most experts have their own understanding of DE, so there are a lot of various digital earth prototype system was developed, such as the Alexandria digital earth modeling system developed by the UCSB, digital earth prototype developed by the NASA, and earth simulator developed by the Japan and so on. Each of them has their own infrastructure and characteristics in developing process. Besides, there are still many commercial digital earth software popularly, such as the famous Google earth, word wind, skyline, and blue link and so on. They have the one biggest common that is all of them were based on the vast remote sensing image and represented by virtual reality technology. But when we reviewed the current situation of digital earth research presented from the outcomes of the International Symposium on Digital Earth four times, and investigated most of these digital earth system and software, we found the studies on digital earth system have some shortcomings. Therefore, facing this situation, in this paper, firstly, we will review the situation and the development of the Digital Earth research. Then, we will emphasize on how to construct the Digital Earth Prototype and develop its system from some new perspectives by the most prevalent techniques.

Keywords: digital earth; digital earth system; digital earth prototype; system architecture;

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No. 409

Studying about the developing method of rendering and broadcasting the large scale terrain

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ABSTRACT

Rendering and broadcasting the large scale terrain on internet is a hot and challenging topic in the Computer Graphics research field. In order to get the ideal terrain rendering, some experts have put forward a couple of good solutions for Level of Detail (LOD) which effectively reduces the quantity of the presented triangles, including the quad-tree algorithm on which this paper is based. Rather than the quad-tree algorithm itself which has been discussed a lot, this paper has elaborated a series of methods used in developing this algorithm during the process of rendering and broadcasting large scale terrain. In this paper, we have discussed these methods in the following sequence: first terrain data preprocessing, then rendering and last broadcasting, in which order the practice will also follow. It has been proved that these methods are quite effective according to the success of the "Remote Forest Monitoring System", which is based on them.

Keywords: Terrain visualization, LOD, Windows media format SDK, stream media technology, quad-tree

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No. 411

Assimilation of remote sensing data into a process-based ecosystem model for monitoring changes of soil water content in croplands

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ABSTRACT

Soil water content (SWC) is an important factor affecting photosynthesis, growth, and final yields of crops. The information on SWC is of importance for mitigating the reduction of crop yields caused by drought through proper agricultural water management. A variety of methodologies have been developed to estimate SWC at local and regional scales, including field sampling, remote sensing monitoring and model simulations. The reliability of regional SWC simulation depends largely on the accuracy of spatial input datasets, including vegetation parameters, soil and meteorological data. Remote sensing has been proved to be an effective technique for controlling uncertainties in vegetation parameters. In this study, the vegetation parameters (leaf area index and land cover type) derived from the Moderate Resolution Imaging Spectrometer (MODIS) were assimilated into a process-based ecosystem model BEPS for simulating the variations of SWC in croplands of Jiangsu province, China. Validation shows that the BEPS model is able to capture 81% and 83% of across-site variations of SWC at 10 and 20 cm depths during the period from September to December, 2006 when a serous autumn drought occurred. The simulated SWC responded the events of rainfall well at regional scale, demonstrating the usefulness of our methodology for SWC and practical agricultural water management at large scales.

Keywords: ecosystem model, remote sensing, soil water content, assimilation

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No. 413

Study on Spatial Knowledge Representation and Reasoning Based on Bayesian Networks

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ABSTRACT

Spatial information plays an essential role on the progress of science and technology, and has a profound impact on economic growth and society progress in the twenty-first century. Spatial knowledge representation and reasoning are very important for us to utilize spatial information. In this paper, a review is presented on spatial knowledge representation and reasoning. And then we propose a method of spatial knowledge representation and reasoning based on Bayesian networks. We focused on how to represent spatial relationship, spatial objects and spatial features by using Bayesian networks. Let spatial features (or spatial objects, spatial relationships) as variables or the nodes in Bayesian network, let directed edges present the relationships between spatial features, and the relevancy intensity can be regarded as confidence between the variables (the same as probability parameter in Bayesian network). Accordingly, the problem of spatial knowledge representation will be changed to the problem of learning Bayesian networks. The experimental results are given to verify the practical feasibility of the proposed methodology. Eventually, we conclude with a summary and a statement of future work.

Keywords: Bayesian networks, spatial relations, knowledge representation, spatial reasoning, data mining

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No. 414

Study on GIS-Based Sport-Games Information System

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ABSTRACT

With the development of internet and such info-technologies as, Information Superhighway, Computer Technology, Remote Sensing(RS), Global Positioning System(GPS), Digital Communication and National Information Network(NIN),etc. Geographic Information System (GIS) becomes more and more popular in fields of science and industries. It is not only feasible but also necessary to apply GIS to large-scale sport games. This paper firstly discussed GIS technology and its application, then elaborated on the frame and content of Sport-Games Geography Information System(SG-GIS) with the function of gathering, storing, processing, sharing, exchanging and utilizing all kind of spatial-temporal information about sport games, and lastly designed and developed a public service GIS for the 6th Asian Winter Games in Changchun, China(CAWGIS). The application of CAWGIS showed that the established SG-GIS was feasible and GIS-based sport games information system was able to effectively process a large amount of sport-games information and provide the real-time sport games service for governors, athletes and the public.

Keywords: Geographic Information System; Public Service; Sport Games; the Sixth Asian Winter Games

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No. 415

Semantic expressions of geographical ontology in the city reference frame model

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ABSTRACT

Spatial relations are the foundation of spatial analysis which has important roles in GIS. A reasonable coordinate frame model should be able to describe the orientation relations of two geographic objects clearly, which is part of spatial relations. The reference frame model, which is built according to the spatial pattern of city layout and reflects human's geographic cognition, is helpful in qualitative spatial reasoning, geographic semantic expression, and inquiring based on the natural languages. Geographical ontology is about the knowledge and concepts which have in common in the domain of geography. A semantic model based on ontology can describe the connection of two concepts and provide a new way to construct concept models. This paper mainly studied the meaning of geographic concepts based on 12-direction city coordinate frame model of Beijing. The way of exchanging geographic knowledge and geographic semantic expressions are also important parts of this paper. **B**ased on the reference frame model, the paper built a knowledge database of geographic ontology. The spatial and non-spatial knowledge could be expressed and inferred by the database. This research makes full preparation for establishing the LBS service structure supporting natural languages.

Keywords: Ontology, spatial cognition, coordinates frame model, semantics, natural language

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No. 416

GAP Analysis of Wetland Bird Habitat Diversity in Sanjiang Plain

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ABSTRACT

Sanjiang Plain was chosen as the study area in this paper, based on the relationship between species and their habitats, using principles of landscape ecology and protection biology, "3S" technique, GAP analysis of biodiversity protection on a regional scale, same surface areas of hexagons as forecasting and evaluating units to analyze protection status of wetlands birds and diversity of their habitats, to find the unprotected biodiversity hotspots there and then analyze the priority protection. As expressed from the research, some birds under second class state protection as Bubo bubo, Falco peregrinus, Accipiter gentilis, Falco tinnunculu, and Strix uralensis have not been well protected, ecological systems of forest hummocks, reed swamps and river wetlands gets worse protection. Thirteen hotspots have been discovered in this area, which are mainly distributed in surroundings near nature reserve and coast of some great rivers. GAP analysis for regions lacking data proposed in this paper not only put forward scientific evidence for the protection and management of wetland biodiversity in Sanjiang Plain, but also enriched theories and methods for China biodiversity protection.

Keywords: GAP analysis, habitat diversity, wetland birds, 3S technique, Sanjiang Plain

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No. 420

Design and Realization of Intelligent Tourism Service System Based On Voice Interaction

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ABSTRACT

Voice technology is one of the important contents to improve the intelligence and humanization of tourism service system. Combining voice technology, the paper concentrates on application needs and the composition of system to present an overall intelligent tourism service system's framework consisting of presentation layer, Web services layer, and tourism application service layer. On the basis, the paper further elaborated the implementation of the system and its key technologies, including intelligent voice interactive technology, seamless integration technology of multiple data sources, location-perception-based guides' services technology, and tourism safety control technology. Finally, according to the situation of Nanjing tourism, a prototype of Tourism Services System is realized.

Keywords: Mobile GIS, voice interaction, tourism services system

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No. 421

Design and Implementation of a decentralized Self-coordinating Distributed Remote Sensing Image Processing System

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ABSTRACT

With the development of remote sensing technological, the data of remote sensing has become even huger, and the process is more complex and time-consuming. This paper presents a decentralized self-coordinating distributed method, designs and implements a decentralized self-coordinating distributed remote sensing image processing prototype system. The principle of this system is to assign remote sensing image processing to other node according to global directory, so as to accelerate the speed of the process. The global directory records all nodes' information including the load balance factor which records the nodes' capability of processing remote sensing image. It provides a new distributed computing model for the remote sensing image processing and gives the remote sensing image processing system flexibility, scalability, higher performance and reliability scale.

Keywords: decentralized, distributed system, remote sensing image processing, global directory

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No. 423

A Bitmap Index Technology Adapt to Original TM/ETM+ Image Database

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ABSTRACT

Spatial database is an essential component of Geographic Information System (GIS). With the development of modern remote sensors and data acquiring instruments, the amount of spatial data increases with geometric series. Retrieval required data in such massive database is a challenging issue to database engineers. Therefore, building efficient index is significant to spatial database. In this paper, bitmap index technology, which is rarely used in spatial database, is taken into consideration. In this paper, TM/ETM+ images covered main land of China are selected to establish a spatial database. In order to rapidly inquire and retrieval required data from the spatial database, an effective spatial index is very important. A bitmap index solution for original TM/ETM+ image is advanced in this paper. The bitmap index schema, which indexes field by building "0"and "1" binary bit vectors, is designed based on analyzing its principle and applicable conditions. In the image database, the strategy is programmed to implementation and applied for data retrieval. So that complex querying operations can be transformed to bitwise logical operations. A users' interface is developed based on building such bitmap index for original TM/ETM+ images database. Then the paper probes into the bitmap index update mechanism to address problems resulted from inserting and deleting images operation. In order to address the problem of high cardinality, an encoded bitmap index technology is proposed as well. At last, a simple comparison and efficiency analysis is carried out to illuminate its applicability.

Keywords: spatial database, image database, bitmap index, encoded bitmap index, Geographic Information System (GIS)

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No. 427

Key solutions to Geographical information synchronizing in GRID-GIS

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ABSTRACT

Geographical GRID system is of great importance at fields as public security, military action, emergency response etc. The homogenizing distributed geographic environment system requires same geographical information for operations in each node. The bottle neck is how to reliably and accurately synchronize the great volume geographical data. This paper solves the problem in three ways. First, Message server queue is constructed for stable message delivery. In this way, the message server always has its alternative in preparation for breakdowns, and the whole GRID always has single working message server. Then the message server queue can be constructed and effectively woks. This mode has the advantages of the other two modes that the message delivery is more reliable and less time-costing. Second. Both push and pull modes are adopted to send messages in time. Push mode means the node which has altered its data is responsible for the delivery of the changed part, like "push" the data to the message server. While pull mode means the demand node or the message server is responsible to check the data status in other nodes and "pull" the new data from the source. In push mode, if the network between the sponsor node and the message server breakdown, the message could be missing or the sponsor could be halted, when the network resumed, the update action could not be invoked again. And in pull mode, the message server needs to check the data and collect update parts in the whole grid, it is a time-costing operation that could not be executed frequently. So the combination mode is adopted. In combination mode, not only each node has its own update trigger to invoke the delivery of the new data, but also the message server also can recurrently check the data status after an assigned interval according to the network situation and the computation ability, then the duly update can be guaranteed.Three, extended GML is developed to wrap the geographical data. GML defines a lot of types of elements and attributes to describe geographical

entity in detail. But to synchronize geo-information in GRID-GIS, these definitions are not adequate. Because the spatial data must be wrapped into small flexible and linkable unit to cut down the time of delivering and receiving which are the most unstable periods in synchronizing course and to resend and assembly the units in unambiguous order. So our system developed the extended GML format, in which granularity level、including relation、inner string length are defined. By its help, the volume of data message is controllable and it is more reliable and accurate to resend and assembly the data fragments.These three methods are the key solutions to the geographical information synchronizing in GRID-GIS. Their validity has proved in practice.

Keywords: GRID-GIS, geographical information synchronizing, Message server queue, combination message deliver mode, extended GML

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No.429

Design and Implementation of Epidemiological Field Investigation Method Based on Mobile Collaboration

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ABSTRACT

With the development of mobile technologies and the integration with the spatial information technologies, it becomes possible to provide a potential to develop new techno-support solutions to Epidemiological Field Investigation especially for the disposal of emergent public health events. Based on mobile technologies and virtual geographic environment, the authors have designed a model for collaborative work in four communication patterns, namely, S2S (Static to Static), M2S (Mobile to Static), S2M (Static to Mobile), and M2M (Mobile to Mobile). Based on the model mentioned above, this paper stresses to explore mobile online mapping regarding mobile collaboration and conducts an experimental case study of HFRS (Hemorrhagic Fever with Renal Syndrome) fieldwork, and then develops a prototype system of emergent response disposition information system to test the effectiveness and usefulness of field survey based on mobile collaboration.

Keywords: Mobile Online Mapping, Mobile Collaboration, Collaboration Model, Fieldwork, Virtual Geographic Environments

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No. 430

Spatio-temporal Data Revision: A Review

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ABSTRACT

The revision of geographical data is still one of the major open challenges for the successful implementation of Geographic Information Systems (GIS). Nowadays, Geographic Information Systems are considered to be truly analysis and decision-making tools. For that reason, a growing number of organizations invest in such systems and add specific information necessary to the tasks for which they have the responsibility. Spatial data are the backbone of GIS analysis, but only current and accurate spatial data can provide the appropriate framework for successful use of GIS technology. Out-of-date or inaccurate spatial data could contaminate GIS results in direct correlation to the obsolescence and inaccuracy of the spatial data. There is a great need for cost-efficient spatial data revision and quality control methods in order to update the master and user spatial databases, fulfilling the request of the most faithful image of the geographic space reality. This paper tries to provide a review of latest achievements on Spatio-temporal Data Revision (SDR). A comparison of three popular revision models is given in detail.

Keywords: spatio-temporal data, revision, SDR, review

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No. 431

Using Projection Pursuit Learning Network Architecture to Detect Land Use Changes

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ABSTRACT

A robust method to conduct land use change detection between multi-temporal images using projection pursuit learning network architecture (PPLNA) is proposed. The method uses a parallel approach that includes three different PPLNs: two of them are used to generate the change map using the multi-spectral information, while the third produces a change mask exploiting multi-temporality. The distinctive feature and major merit of PPLNA from traditional neural network for land use change detection are the proposed method simultaneously exploits both the post classification of multi-spectral and multi-temporal information that is associated with the changes values of the pixel spectral reflectance, and hence improve the change detection accuracies. To validate the performance of the proposed method, the experiments using the ETM+ images for the area of Calgary have been carried out. The accuracies of the final classification and change detection maps have been evaluated with ground truth comparisons. The experimental result demonstrates that the proposed method achieves better accuracies.

Keywords: projection pursuit learning network, change detection, ETM image, land use

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No. 433

Study on Snowmelt Flood Forecasting Based on "3S" Technologies and DSS

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ABSTRACT

Flood disaster is one of the most frequently and the biggest natural disasters in the world, and snowmelt floods which break out in spring often bring enormous social and economic loss, especially in arid and semi-arid areas, such as in Northern Tianshan Mountains in Xinjiang, China. Any effective prevention or mitigation of disasters is built on the basis of forecasting, so the real-time processing, snow information analysis, and weather forecasting, are combined into a system which can provide intelligent reports and prewarning information of snowmelt flood duly and accurately for the government departments or other organizations. So it is of great significance for flood prevention and disaster reduction. Furthermore, effective forecasting and prewarning can generate enormous social, economic and ecological benefits, so the establishment of a real-time, efficient and reliable Flood Forecasting/Prewarning DSS, is an important part of the building of non-engineering measures for flood prevention and disaster reduction. Now the integrated applications of remote sensing(RS), geographic information systems(GIS) and global positioning systems(GPS), named "3S" technologies, have been infiltrated through hydrology and water resource management, and there are rapid developments and extensive applications of Decision Support System (DSS) in recent years in many fields. But there is seldom appearance of mature applications of Snowmelt Flood Forecasting/Prewarning DSS, and a shortage of study on effective Snowmelt Flood Forecasting. In this paper, firstly, a Distributed Snowmelt Runoff Model had been built based on the "3S"

technologies, and then a Snowmelt Flood Forecasting DSS based on the B/S (Browser server) and J2EE structure had been established, then introduced the T213 Numerical Forecasting Production from WRF mode and revised it with our synchronous field observation data. Various snow information and other basic geoinformation also had been extracted from RS imagines or other data with RS and GIS tools. At last, snowmelt flood based on "3S" technologies and DSS had been forested in the typical study area, Quergou River Basin, which is located in the middle of the Northern Tianshan Mountains, Xinjiang, China, and is contrasted with the latter measured runoff. Good forecasting results had been achieved, and the average accuracy was up to 0.90.

Keywords: Snowmelt Flood Forecasting, Distributed Snowmelt Runoff Model, RS, GIS, DSS.

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No. 434

Schema Integration of heterogeneous geospatial database

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ABSTRACT

The integration of heterogeneous geospatial data offers possibilities to manually and automatically derive new information, which are not available when using only a single data source. This paper presents a three-level schema integration architecture which consists of local schemas, mapped schemas, and a global schema, for global heterogeneous geospatial systems. We describe a machine-learning based approach for GIS schema matching. Our approach extends existing machine-learning approaches for (traditional) data mapping but departs from them due to the nature of geographic data. Our solution reduces the complex mappings by identifying different values of a determining property.

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No. 437

Extended Fractal Analysis Method and Its Application for Linear Rivers

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ABSTRACT

Extended fractal analysis method can analyze the fractal character (i.e. self-similarity) objectively, especially the difference and change of the shape and the structure in different observation scale intervals. As one of the common fractal objects, river on the map can be surveyed its length and quantified the complexity of its shape and structure as well as its partial details with Extended Fractal Dimension Analysis method (abbreviated as EFDA). Compared to the traditional method, EFDA has unparalleled advantages. Considering the extended fractal character with scaling variance, and based on its simulating function adopting the Inverse Logistic Model, the paper gained the extended fractal function for quantifying the length of the river depending on the different observing scales. Furthermore, based on the mathematical derivation of its simulating function and fractal analysis, the paper obtained the relevant parameter for establishing Meta Fractal Dimension (abbreviated as MFD) Model to quantify the local complexity of the river on the map. Several experiments based on the China's seven major rivers done indicate that this method is easy to operate and has a relatively high calculation precision and a logical result of spatial analysis.

Keywords: extended fractal dimension, fractal measurement for length, partial shape, Meta fractal dimension curve

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No. 438

Two Improved Algorithms of High Degree Seeking Strategy for Complex Networks

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ABSTRACT

Recently complex networks have aroused the attention from a number of scholars, raising the upsurge of studying complex networks. High degree seeking strategy (DS) has been proved to be an effective algorithm of searching complex networks. This paper puts forward two algorithms to improve the high degree seeking strategy (DS) by adding two criteria to the selection of neighboring nodes. According to the improved algorithms, the degrees of and distances to the neighbors' neighbor will be compared when two or more neighbors of the currently processed node have the highest degree. Experiments are carried out to compare the efficiency of the high degree seeking strategy and its improved versions. Case studies show that the improved algorithms are more efficient than the original one when searching in a network with a huge number of nodes.

Keywords: Complex network, High degree seeking strategy (DS), Algorithm, Improvement

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No. 439

Design and Implementation of a Geospatial Portal

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ABSTRACT

Geospatial portals use Web Services to publish available geospatial data and processing services, help applications find them and invoke services or retrieve data. OGC has developed Geospatial Portal Reference Architecture to assist to implement a standards based geospatially enabled portal application. The Geospatial Portal Reference Architecture is a major for E-Government, National Spatial Data Infrastructures, enterprises and Information Communities. It enables geoprocessing interoperability that makes it possible to exchange heterogeneous geographic information content and share a wide variety of geospatial services over the World Wide Web. In this paper, we study the Geospatial Portal Reference Architecture. On the basis of this reference, we design and implement a geospatial portal. We describe the architecture of this portal, development and deployment of this portal. We detail system workflow and functions.

Keywords: geospatial portal; Spatial Data Infrastructure; interoperability; service-oriented architecture; Web Services

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No. 441

The Simulation of Satellite Tracking and Orbit Prediction, Considering the Swaths

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ABSTRACT

A simulation system is developed for satellite tracking and orbit prediction. The program displays the location of Earth satellites and predicts the location of any satellite at any time. And the simulation of satellite tracking and orbit prediction take the swaths into consideration. The orbit prediction model and Two-Line Element (TLE) Sets are present first, and the Simplified General Perturbations Version 4 and Simplified Deep-space Perturbation Version 4 (SGP4/SDP4) orbit propagation algorithms are introduced then. In the end, we introduce how we build our system in detail. In the end we present the comparison of the prediction result between the system of ours and STK's. The result shows that SGP4/SDP4 are efficient and valid in our system.

Keywords: Simulation, satellite tracking, orbit prediction, swaths

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No. 443

Artificial immune algorithm for multi-depot vehicle scheduling problems

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ABSTRACT

In the fast-developing logistics and supply chain management fields, one of the key problems in the decision support system is that how to arrange, for a lot of customers and suppliers, the supplier-to-customer assignment and produce a detailed supply schedule under a set of constraints. Solutions to the multi-depot vehicle scheduling problems (MDVRP) help in solving this problem in case of transportation applications. The objective of the MDVSP is to minimize the total distance covered by all vehicles, which can be considered as delivery costs or time consumption. The MDVSP is one of nondeterministic polynomial-time hard (NP-hard) problem which cannot be solved to optimality within polynomial bounded computational time. Many different approaches have been developed to tackle MDVSP, such as exact algorithm (EA), one-stage approach (OSA), two-phase heuristic method (TPHM), tabu search algorithm (TSA), genetic algorithm (GA) and hierarchical multiplex structure (HIMS). Most of the methods mentioned above are time consuming and have high risk to result in local optimum. In this paper, a new search algorithm is proposed to solve MDVSP based on Artificial Immune Systems (AIS), which are inspirited by vertebrate immune systems. The proposed AIS algorithm is tested with 30 customers and 6 vehicles located in 3 depots. Experimental results show that the artificial immune system algorithm is an effective and efficient method for solving MDVSP problems.

Keywords: Location Based Services (LBS), Artificial Immune Systems (AIS), clone selection, Immune suppression, multi-depot vehicle scheduling problems (MDVSP)

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No. 444

A Study of Land Use / Land Cover Information Extraction Classification Technology Based on DTC

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ABSTRACT

Decision Tree Classification (DTC) is one organizational form of the multi-level recognition system, which changes the complicated classification into simple categories, and then gradually resolves it. The paper does LULC Decision Tree Classification research on some areas of Gansu Province in the west of China. With the mid-resolution remote sensing data as the main data resource, the authors adopt decision-making classification technology method, taking advantage of its character that it imitates the processing pattern of human judgment and thinking and its fault-tolerant character, and also build the decision tree LULC classical pattern. The research shows that the methods and techniques can increase the level of automation and accuracy of LULC information extraction, and better carry out LULC information extraction on the research areas. The main aspects of the research are as follows: 1. We collected training samples firstly, established a comprehensive database which is supported by remote sensing and ground data; 2. By utilizing CART system，and based on multiply sources and time phases remote sensing data and other assistance data, the DTC's technology effectively combined the unsupervised classification results with the experts' knowledge together. The method and procedure for distilling the decision tree information were specifically developed.3. In designing the decision tree, based on the various object of types classification rules, we established and pruned DTC'S model for the purpose of achieving effective treatment of subdivision classification, and completed the land use and land cover classification of the research areas. The accuracy of evaluation showed that the classification accuracy reached upwards 80%.

Keywords: DTC, mid-resolution, LULC, model, information extraction

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No. 445

High Precision Mobile Location Framework and its Service Based on Virtual Reference Station of GPS

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ABSTRACT

The wireless communication technology and space technology are synchronously developed in recent years, which bring up the development of location based service (LBS). At present, many location technology methods were developed. However, all these methods can only provide a relative poor location precision and depend on high cost. The technology of Virtual Reference Station (VRS) of GPS is then involved in this paper. One of the objective in this paper is aim to give the LBS position structure to improve the mobile location position when a mobile position instrument is connected with VRS network. The cheaper GPS built-in Personal Designer Aid (PDA) is then used to achieve a higher precision by using RTCM data from existing VRS network. In order to obtain a high precision position when using the low-cost GPS receiver as a rover, the infrusture of the mobile differential correction system is then put forward. According to network transportation of RTCM via internet protocol (NTRIP), the message is communicated through wireless network, such as GPRS, CDMA and so on. The rough coordinate information is sent to VRS control center continuously, and then the VRS correction information is replied to rover in the data format of RTCM3.1. So the position will be updated based on mathematic solution after the decoding of RTCM3.1 data. The thought of LBS position can improve the precision, and can speed the LBS.

Keywords: Virtual Reference Station, RTCM, Decoding, Mobile location service

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No. 446

Research on Construction of Large-scale 3D City Models based on Skyline Prototype System

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ABSTRACT

The construction of large-scale three-dimension city models faces the problem that the data is too huge, the mission is too heavy, and the development cycle is too long. Facing so many types of buildings and other city objects, it is very difficult to finish the Construction of 3D city models quickly and efficiently using only one technical method. How to operate the construction of large-scale 3D city model based on multi-source data quickly and efficiently is a hot issue in current researches. This paper proposes the method of constructing large-scale urban three-dimension landscape and creating virtual reality by using Skyline, a powerful software of 3DGIS, which is based on two source data, RS image and DWG. It also gives a detailed illustration on the key problems related to the construction during the course of construction, such as modeling of the particular object, texture projection, etc.

Keywords: 3D City Models, Large-scale, skyline

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No. 447

Visualizing Research of Land Use Land Cover Change

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ABSTRACT

Land use/cover change (LUCC) has emerged in the research agenda on global environmental change since the mid-1970s. Considerable progress has been made in LUCC related studies and these research efforts have generated numerous peer-reviewed papers. Because land use dynamics has also been identified as one of the grand challenges of the next generation in environmental sciences, it is important to understand the structure and development of the LUCC research activities. In this study, self-organizing map, a data mining tool that excels in presenting similarities of data based on data contents, is used to visualize the LUCC research activities. We analyze abstracts and introductions of the peer-review journal articles from selected journals. More than 600 articles with land use or land cover in their titles or keywords are included in the analysis. Keywords of the articles, representing different LUCC research topics, are compiled, and the frequencies of these keywords in the articles are counted. The results are presented in map-like displays to illustrate LUCC research activities. A total of eight main research clusters are identified and the research activities within each cluster are discussed.

Keywords: land use land cover change, self-organizing map, data mining, information visualization, knowledge domain

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No. 448

Application of IPv6 in GIS

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ABSTRACT

The inherent flaws in current network, especially the inadequate IP address space, make the born of NGN (Next Generation Network). The NGN aims to enable the information sharing and inter-operation of heterogeneous networks. As the core of NGN, IPv6 (Internet Protocol version 6), which is designed as the successor of IPv4 running now, brings us many new features. It provides larger address space, supports mobile devices, and has built-in security policy, and so on. Although it brings us so many advantages and the backbone of NGN also has been constructed in many countries, we have difficulties moving to NGN. One of the main reasons is there are few killer applications for it. So what features can be employed by GIS, and how to use them is the main content of this paper. The IPv6 certainly offers new entry to solve some problems in GIS.

Keywords: IPv6 application, Next Generation Network, Geographic Information System

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No. 449

Land Use and Environmental Change Analysis Based on Remote Sensing—A Case Study of Upper Stream Management of Hsin-Dian River

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ABSTRACT

Taipei Water Source Domain is established to protecting the water source which supplied approximately 5 million populations in the large Taipei living area to avoid destroy and pollution. Therefore, land management of water source domain becomes the key point to prevent these problems. Using the remote sensing technology to manage the land use is the major target in this research. We employed Supervised Classifier to classify the land use and land cover type. We utilize spatial analysis to investigate the current land use condition and employ post-classification comparison algorithm for land use types' change analysis. The classification overall accuracy of 2006 is 95.60%. The result of environmental change detection analysis of land use categories shows that vegetation goes through three period's growth tendency. However, the change analysis through 1998 to 2006 points out the area near Hsin-Dian and Ping-Lin had a magnitude change.

Keywords: land use, land cover, environmental changes, remote sensing

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No. 450

GIS Information Organization Based on Semantic Geospatial Web

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ABSTRACT

People typically use geographic names instead of coordinates to find geographic information on the web through a search engine. But the current keyword-based web search engines are poorly adapted to help people find information that relates to a particular geographic name, because they don't incorporate the geospatial semantic during the search process. The Semantic Web is a new semantic-based information-retrieval environment. We propose the information organization framework of the GIS semantic data according to the architecture of the Semantic Web, that is, the ontology, the metadata and the data source. Then we deal with the organization of the semantic data based on the three-layered framework respectively. As a focus, we present a novel method to disambiguate geographical name based on the ontology of the place.

Keywords: Semantic Geospatial Web, geographic information retrieval, Information Organization, ontology of place, construction of ontology, GIS

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No. 452

A Spatial Query Scheduler in a Distributed Environment

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ABSTRACT

Geographic Information System (GIS) is moving towards distribution and sharing. Distributed Spatial Database Systems (DSDBS) has attracted the attention of many scholars. This paper introduces the prospects of Distributed GIS (DGIS), and describes the definition of DSDBS and the existing problems. The researches in related fields are analyzed, including the research results in the traditional distributed relational database fields, the distributed spatial database fields and the spatial query optimization aspect. Grid technologies are developing forward, and grid will be turned into the standard distributed computing platform, therefore the application of DSDBS will be much broader than ever. The present studies on distributed spatial query focus on spatial join optimization. Researches on query scheduling are rare. In the process of constructing our test system for distributed spatial query, we find there are some replication nodes after the step of data localization. These nodes cause redundant computing of query processing. This paper gives a method to solve it based on the Query Scheduling Tree Model (QSTM). It also gives a detailed scheduling algorithm, and analyzes the effectiveness of the model and the algorithm.

Keywords: Spatial Query, Scheduling Algorithm, Query Scheduling Tree

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No. 453

High-accurate Ellipse Feature Extraction Algorithm Based on Line Diffusion Function Model

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ABSTRACT

Ellipse feature is widely accepted as one of the most fundamental features and its extraction in image has very important significance in many fields. We addressed the problem of extraction of ellipse with high accuracy in this paper. An ellipse extraction algorithm based on line diffusion function model has been proposed using local gray value variation to precisely identify edge location. This algorithm can automatically extract ellipse and carry through high-accurate ellipse localization. This paper firstly analyzed the primary principle of line diffusion function mode, then described the implementation of high-accurate ellipse feature extraction algorithm based on line diffusion function model. During the process, the mathematical model is provided and high-accurate ellipse feature extraction algorithm has been developed. Finally, the proposed approach is tested with real imagery and experimental results are presented to demonstrate the efficiency and accuracy of the proposed algorithm.

Keywords: Line Diffusion Function Model, high-accurate ellipse extraction, fitting, least-square

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No. 456

A Prototype Design of Parallelizing GIS operations

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ABSTRACT

The ever-increasing of the large geospatial datasets and the widely application of the complex geocomputation make the parallel processing of GIS an important component of high-performance computing. The paper introduces a two-phase load-balancing scheme for the parallel GIS operations in distributed environment. The paper focus on the parallel framework design and parallel strategy implement of the spatial operations in GIS. Two major aspects of the spatial data partitioning and dynamic load schedule are discussed in detail, declustering the massive data sets into two parts hierarchically: the dynamic share data and the static local data. In the experimental test, we build up the analytical cost model and evaluate the utilize rate of computational power and I/O resource, and analyze the efficiency of the proposed parallel prototype.

Keywords: parallel computing, spatial data partitioning, load balancing, GIS spatial operations

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No. 459

Green Space System Design in Luoyang Using Huff Model

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ABSTRACT

Green space system, as part of the urban ecological environment and urban landscape, plays a significant role in the protection of biological diversity of the urban eco-systems. During the process of rapid modernization in China, it is evident that in order to satisfy the residents' needs of entertainment and communication effectively; there should be abundant types and adequate arrangement of green space. And at the same time a comprehensive and stable hierarchical structure of green space system ought to be established. Huff Model is widely used in facility location planning and service area segmentation in business geography, and has potentials in urban facility planning and design. This paper aims to evaluate, design and optimize the urban green space in Luoyang City, Henan Province, using GIS and Huff Model. Considering the existing location, size and shape of the green space supply, the spatial distribution of residence and the urban transportation systems, the attractiveness between residence and green space is estimated. The spatial pattern and service capability of the green space system are also evaluated critically. Based on the findings, the possible optimization design of the green space system in Luoyang is discussed innovatively. Huff model test shows that the design improves the overall spatial accessibility observably. The case study shows that GIS technology and Huff Model have great potential in urban green space evaluation, planning and design.

Keywords: Green space system, Huff model, green space design, Luoyang City

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No. 460

Study on High Resolution Representation of Terraces in Shanxi Loess Plateau Area

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ABSTRACT

A new elevation points sampling method, namely TIN-based Sampling Method (TSM) and a new visual method called Elevation Addition Method (EAM), are put forth for representing the typical terraces in Shanxi loess plateau area. The DEM Feature Points and Lines Classification (DEPLC) put forth by the authors in 2007 is perfected for depicting the main path in the study area. The EAM is used to visualize the terraces and the path in the study area. 406 key elevation points and 15 feature constrained lines sampled by this method are used to construct CD-TINs which can depict the terraces and path correctly and effectively. Our case study shows that the new sampling method called TSM is reasonable and feasible. The complicated micro-terrains like terraces and path can be represented with high resolution and high efficiency successfully by use of the perfected DEPLC, TSM and CD-TINs. And both the terraces and the main path are visualized very well by use of EAM even when the terrace height is not more than 1m.

Keywords: DEM, D-TIN, high resolution, terrace, micro-terrain, visualization, Loess Plateau

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No. 461

Real-time visualization of virtual geographic environment using the view-dependent simplification method

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ABSTRACT

A real-time virtual geographic environment (VGE) can serve as interactive, intuitive visualization tools for exploring, analyzing, synthesizing, and simulating multi dimension geo-data and complex geo-phenomena. The VGE scene can be constructed by terrain models, building models, and natural gaseous phenomena models. This paper used a view-dependent simplification method to improve the rendering efficiency of the VGE scene. The continuous level of detail technique(C-LOD) algorithm was adopted to achieve high frame rates by generating an approximate view-dependent triangulation of large terrain scene. Meanwhile image-based rendering techniques such as the imposter billboard were used to speed up the visualization of 3D object models (e.g., 3D building, 3D trees, smoke, cloud and so on). Using the Pearl River Delta (PRD) region in China as a case area, the visualization environment was built to support real-time rendering of larger-scale geo-scene. Experiment results prove that the scheme addressed in the paper can improve the overall efficiency.

Keywords: virtual geographic environment, view-dependent simplification, real-time, Level of Detail

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No. 463

Scale dependence of autocorrelation from a remote sensing perspective

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ABSTRACT

Spatial autocorrelation has been proved to be a useful tool in many fields, including spatial heterogeneity research and spatial structure investigation. With the increasing of remote sensors, images of different resolutions are being acquired and put into usage. So how to select images of appropriate spatial resolution becomes to be a great challenge. Therefore, it's necessary to investigate the scale dependence of the spatial autocorrelation in remotely sensed images, as Jupp et al (1989) has declared that the spatial autocorrelation in an image is related with the spatial resolution. In this paper, panchromatic band of the QuickBird imagery is aggregated into a series of images of coarser spatial resolution and used to investigate the scaling effects. Both global and local spatial autocorrelation measures at different scales are calculated. Results show that global autocorrelation increases as the resolution becomes coarser and lag distance decreases. Local autocorrelation shows dependence on scale and the land cover type. It's necessary to combine global and local measures together to explore the intrinsic of spatial autocorrelation.

Keywords: scale dependence, spatial autocorrelation, remotely sensing

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No. 466

A Variational Image Restoration with Spatially Varying Noise

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ABSTRACT

The noise in natural images sometimes changes according to imaging mechanism or local image information. This is called spatially varying noise. It is obvious that classical variational denoising algorithms such as the Rudin-Osher-Fatemi model are not suitable for this kind of noise. We propose a variational method to remove this spatially varying noise based on the estimation of local variance for a given image, such that high noise regions are smoothed meanwhile the textures and certain details in low noise regions are preserved. Moreover, we give the proof of existence of the minimizer of our proposed functional. The experimental results show visual improvement and high signal-to-noise ratio over other variational denoising models.

Keywords: variational method, spatially varying noise, image restoration

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No. 467

Spatial Grid Services for adaptive spatial query optimization

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ABSTRACT

Spatial information sharing and integration has now become an important issue of Geographical Information Science (GIS). Web Service technologies provide a easy and standard way to share spatial resources over network, and grid technologies which aim at sharing resources such as data, storage, and computational powers can help the sharing go deeper. However, the dynamic characteristic of grid brings complexity to spatial query optimization which is more stressed in GIS domain because spatial operations are both CPU intensive and data intensive. To address this problem, a new grid framework is employed to provide standard spatial services which can also manage and report their state information to the coordinator which is responsible for distributed spatial query optimization.

Keywords: spatial query optimization, spatial data grid service, spatial computing grid service, WSRF, WFS, WPS

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No. 468

Integrated Assessment and mapping of the Regional Eco-environment Based on Integrated Geographical Unit

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ABSTRACT

A harmonious society indicates the harmonious relationship between the person and the nature. People's notion is converted from changing the nature to understanding the nature. The research of the Regional Eco-environment becomes more and more important after long-term practice of human. The digital regional planning at this stage gradually places emphasis on ecological and environmental research in order to accomplish the regional sustainable development. Rs which is the quickly updated and information-rich data sources and GIS which is the effective tool for spatial data integrating and handling plays an increasingly important role in this processing. The paper proposes integrated geographical unit as the basic analysis unit, and delivers the method and the involving elements. Geographical Unit refers to the geographical factor compounding to a certain level, the intermediate structures below the highest level. Integrated relative to the special, two or more specialty can be combined into an integrated. We accomplished two cases study with effect. The one is the research area Beibu Gulf Economic Areas of Guangxi, which lies in the South of The Guangxi Zhuang Autonomous Region of China; the other is Zhangjiajie, which is located in the northwest of Hunan province.

Keywords: regional eco-environment, spatial analysis, integrated assessment, integrated geographical unit

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No. 469

The application and realization of 3D geo-simulation and forecast in the field of bank collapse research based on GIS

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ABSTRACT

With the development of computer science, many kinds of three dimensional software come to the world one after another, and have been applied in many fields, such as PC games、military simulation and geographical information system (GIS) and so on, among which the application of the technique of three dimensional geo-simulation in GIS field has provided new platform、new ideas、and a new significant direction for the development of GIS. This paper is to discuss the methods and realization of three-dimensional(3D) geo-simulation in the field of bank collapse based on GIS, with the research of bank collapse as the cut-in point, which is the important direction in the research of geological disasters, and to give 3D simulation result of the reservoir bank, taking the related data in three gorges reservoir area as the example, and at the same time to give the result of 3D simulation about bank collapse forecast, and at last to appraise these results.

Keywords: 3D, geo-simulation, forecast, bank collapse, GIS

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No. 470

Study on Blimp-Based Low-cost Remote Sensing Platform

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ABSTRACT

The space-born and airborne platforms are major means to acquire the earth surface information. However, the airborne and spaceborne are sometime limited in some special cases such as military area, federal agencies. For this reason, this paper presents study on a blimp-based low altitude remote sensing platform, which has the characters of stability and safety and is easy to operate and control. The details of the hardware configuration and work flow are first described, and some key techniques including calibration, synchronization and aerial triangulation bundle adjustment are emphasized. In this system, low accuracy digital compass is used due to the limitation of blimp payload and cost. With the simulated study and real data analysis demonstrates that under the current hardware specification, the accuracy of 3D object coordinates can reach better than 0.5 m. Moreover, this system can reach equality with the airborne platform with less or without ground control points (GCPs).

Keywords: blimp; low-altitude remote sensing; low-cost hardware; simulation

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No. 472

Study on Urban Land Grading by Evolutionary Approaches to Multi-objective Spatial Decision Making

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ABSTRACT

The results of Urban Land Grading reflect the differences of land quality among the cities. It takes a city as a point, and studies land quality under the influence of the various social, natural and economic conditions. The former classification of urban land is mainly depend on two method: Histogram Method and K-Means clustering analysis. But, both methods have clear limitations as follows: the method of Histogram Method depends on experts' experience, and the accuracy is not high; the method of K-Means clustering analysis mainly depends on attribute neighboring relations of city's grading scores, but neglects spatial distribution characteristics and geometry neighboring relations among cities. In this paper, we regard the city grading operation as a particular application of multi-objective spatial decision making problem, because it has both statistical object (within-grade homogeneity) and geographical object (equal-grade cities with geographical contiguity). And we adopt evolutionary approaches to resolve it.

Keywords: Urban Land Grading, evolutionary approaches, multi-objective spatial decision making

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No. 474

Uncertainty Research of Remote Sensing Image Classification based on Hybrid Entropy Evaluation Model

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ABSTRACT

This study put forward an integrated evaluation model. Bases on a framework of fuzzy set theory and entropy theory, we firstly complete the classification using fuzzy surveillance approach, taking it as a formalized description of classification uncertainty. Then introduce hybrid entropy model for classification uncertainty evaluation, which can meet the requirement of comprehensive reflection of both random and fuzzy uncertainty, meanwhile construct evaluation index from pixel scale with the full consideration of different contribution to error rate of each pixel. Finally, we use such method to evaluate land-use classification result of remote sensing image, which is in Huangshi city, Hubei province of China, by using hybrid entropy evaluation model, the classification quality can be fully reflected, and pixel-scale evaluation indexes were easier constructed.

Keywords: uncertainty of RS image classification, fuzzy surveillance classification, hybrid entropy evaluation model, pixel-scale evaluation indexes

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No. 475

Web Service for Extracting Stream Networks from DEM Data

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ABSTRACT

Stream networks are important features for hydrologic modeling, geomorphologic analysis of landscape, and many other applications. Automatic extraction of stream network from digital elevation model (DEM) has been implemented in major GIS software such as ArcGIS and GRASS based on flow direction along steepest descent and using some threshold criteria to separate channels and hillslope. However, these hydrology based algorithms often tend to produce results that are spatially uniform, not correctly reflecting the spatial variability in stream dissection patterns. In addition, the traditional paradigm of storing and processing everything on a local machine with locally owned software makes it time-consuming and expensive to process and analyze large quantity of geospatial data, which is often required for Earth System Science research. This paper describes the implementation of a morphology based algorithm for extracting stream networks from DEM data as a Web Service within the framework of GeoBrain, an open, interoperable, distributed, standard-compliant, multi-tier web-based geospatial information services and knowledge building system. This is made possible with recent advances in Service-Oriented Architecture (SOA), geospatial Web Services, and interoperability technologies and allows widest possible accessibility, because the only requirement for the user is an Internet connection and a standard web browser.

Keywords: Web Service, DEM, stream networks, D8 algorithm, morphology based algorithm, tangential curvature, GeoBrain

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No. 476

Object-oriented Data Model of the Municipal Transportation

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ABSTRACT

The transportation problem is always one of main questions each big city all over the world faces. Managing the municipal transportation using GIS is becoming the important trend. And the data model is the transportation information system foundation. The organization and storage of the data must consider well in the system design. The data model not only needs to meet the demand that the transportation navigates, but also needs to achieve the good visual effects, also can carry on the management and the maintenance to the traffic information. According to the object-oriented theory and the method, the road is divided into segment, intersection. This paper analyzed the driveway, marking, sign and other transportation facilities and the relationship with the segment, intersection and constructed the municipal transportation data model which is adequate to the demand of vehicles navigation, visual and management. The paper also schemes the the all kinds of transportation data. The practice proves that this data model can satisfy the application demands of traffic management system.

Keywords: data model, transportation, object-oriented, GIS

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No. 477

BVIFM: A Vector Model for Calculating Sunlight Shadow Effect of Terrain on Neighboring Buildings

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ABSTRACT

In order to solve the current problem of the sunlight analyzing models, which are not suitable for most of the mountainous and hilly areas because of ignoring the factors that the topography influences the sunlight, this article will integrate the principles and ideas of "Shadow Equivalence", "Reverse Sunlight" and "Sky Graph", and will propose "Backlighting Vector Intersecting Shadow Projection SurFace Model" (BVIFM), from the angle of the Geometrical Optics. Besides, this article will use a certain residential district in Chongqing Province and the actual terrain data (DEM) as examples to verify the validity and correctness of the BVIFM .The results from the experiments show that the BVIFM can be quite satisfactory, while calculating the sunlight effects caused by the uncertain mountains and hills on their neighboring constructions. The proposal of the BVIFM can not only remedy the shortcomings of the current models, but also provides a new solution for the sunlight calculation as well as laying a foundation of a unified model of the sunlight analysis.

Keywords: Sunlight, Solar Right, BVIFM, terrain, Reverse Sunlight, Backlighting Vector, Shadow Equivalence, Sky Graph

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No. 478

Study on Decision-making Flow Model of High Quality Prime Farmland Planning

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ABSTRACT

High Quality Prime Farmland (HQPF) is a new concept proposed by Zhejiang Province, China, for the purpose of farmland utilization and protection. High Quality Prime Farmland planning is one of land-use planning activities, which intends to decide reasonable scale, distribution and schedules of HQPF construction in planning period. On the basis of analyzing and investigating the business contents in practical work, HQPF planning business is divided as four tasks: evaluating land resource suitability for HQPF, compiling HQPF planning, partially adjusting HQPF planning, and dynamically monitoring HQPF changes. Then, decision-making process of each task is analyzed. In workflow modeling methods are used to depict the decision-making flow model of HQPF planning. Thus, planning decision support system base on decision flow model is designed. This system includes modules of data management, model management, decision-making flow management, and human-computer interface.

Keywords: decision-making flow model, spatial decision support system, high quality prime farmland, GIS

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No. 479

Quality Evaluation of Farmland Landscape Boundary Based on GIS

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ABSTRACT

Landscape boundaries are the heterogeneous landscapes among the relatively homogeneous landscapes on the given temporal-spatial scale. Quality evaluation of landscape boundary is an important component of landscape boundary research. Moreover, it is a research hotspot of Landscape Ecology. The boundary characteristic of farmland landscape influences indirectly ecological process and farmland productivity. This research is aimed to explore the quality evaluation of the farmland landscape boundary on the basis of the original data, with Geographic Information System (GIS) combined with field investigation, and Fujian's Yongtai County is taken as the study area. The research covers four aspects. First, extract correlative thematic maps with the aid of ArcGIS and ENVI, put them under spatial analysis and define farmland landscape unit and acquire unit attribute data. Second, the major measure indexes of farmland landscape boundary are selected, such as patch shape index, patch acreage index and patch contagion index. Third, supported by Landscape Ecology methods, this research puts forward an integrated index reflecting the condition of farmland landscape boundary, and outputs the grade maps of farmland landscape boundary quality on the study area. Finally, a corresponding evaluation map is drawn up, and according to the show of the map, the regional character of farmland landscape boundary quality is analyzed. The results indicate that the farmland landscape boundary quality in the research region is medium and the integrated quality index of farmland landscape boundary could preferably reflect spatial variability of the farmland use landscape.

Keywords: GIS, landscape boundary, quality evaluation

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No. 480

Development of spatio-temporal data model based on feature and time-varying sequence of events for land use in the mining area

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ABSTRACT

The land resource in the mining area has been destroyed badly, therefore to establish a land reclamation information system of mining area based on GIS is of great significance. The spatial information database of land reclamation is a temporal one due to the change of the land resource within the coal mining area. On the basis of the analysis of the characteristics of the land resource in the subsidence region and the advantage of Event-based and Feature-Based Spatio-temporal Data Model, a spatio-temporal data model based on feature and time-varying sequence of events was proposed in this paper, and this model can be used to manage the land information in the mining area. Meanwhile, the spatial information query and the analytic method were also studied in this paper. The advantage of this model is to keep the integrality of feature entity and to connect ground surface event and underground mining event which cause the land information change in the mining area.

Keywords: feature, event, time-varying sequence, spatio-temporal data model, land use

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No. 481

The further development of Legal Cadastral Domain Model of China based on ontology

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ABSTRACT

The cadastral plays a very important role in managing spatial and non-spatial legal real property information. And the legal aspect is the important component of the cadastral. And the success of a cadastral system is not dependent on its legal or technical sophistication, but whether it protects land rights adequately and permits those rights to be traded (where appropriate) efficiently, simply, quickly, securely and at low cost. However, the ambiguity of legal cadastral domain has been the major barrier to data integration and interoperability. This paper intends to optimize the concept model of legal cadastral domain based on the model established in my previous paper which can be a first step towards facilitate the effective interchange of cadastral information and the administration of land use. And the way expressing these conceptions and relationships between them was an object-oriented approach in ontology principles. The outcome of this paper is also a basic but better expression legal cadastral domain model of china.

Keywords: Cadastre, Legal cadastral domain, Ontology, Object-oriented approach, Legal cadastral domain model

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No. 483

A partial least square regression method to quantitatively retrieve soil salinity using hyper-spectral reflectance data

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ABSTRACT

Hetao Irrigation District located in Inner Mongolia, is one of the three largest irrigated area in China. In the irrigational agriculture region, for the reasons that many efforts have been put on irrigation rather than on drainage, as a result much sedimentary salt that usually is solved in water has been deposited in surface soil. So there has arisen a problem in such irrigation district that soil salinity has become a chief fact which causes land degrading. Remote sensing technology is an efficiency way to map the salinity in regional scale. In the principle of remote sensing, soil spectrum is one of the most important indications which can be used to reflect the status of soil salinity. In the past decades, many efforts have been made to reveal the spectrum characteristics of the salinized soil, such as the traditional statistic regression method. But it also has been found that when the hyper-spectral reflectance data are considered, the traditional regression method can't be treat the large dimension data, because the hyper-spectral data usually have too higher spectral band number. In this paper, a partial least squares regression (PLSR) model was established based on the statistical analysis on the soil salinity and the reflectance of hyper-spectral. Dataset were collect through the field soil samples were collected in the region of Hetao irrigation from the end of July to the beginning of August. The independent validation using data which are not included in the calibration model reveals that the proposed model can predicate the main soil components such as the content of total ions(S%), PH with higher determination coefficients(R^2) of 0.728 and 0.715 respectively. And the rate of prediction to deviation(RPD) of the above predicted value are larger than 1.6, which indicates that the calibrated PLSR model can be used as a tool to retrieve soil salinity with accurate results. When the PLSR model's regression coefficients were aggregated according to the wavelength of visual (blue, green, red) and near infrared bands of LandSat Thematic Mapper(TM) sensor, some significant response values were observed, which indicates that the proposed method in this paper can be used to analysis the remotely sensed data from the space-boarded platform.

Keywords: soil salinity; partial least squares regression; hyper-spectral; Remote Sensing

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No. 485

Signals of Opportunity Assisted Ubiquitous Geolocation and Navigation Technology

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ABSTRACT

The desire of geolocation and navigation technologies that provide precise, fast and reliable geo-services has exploded in the recent years, and there is a dramatic increase in the geo-service market varies from mass market applications to the new and innovative applications. The lack of reliable GNSS signals in the NLOS environment confronts many innovative ideas related to mass market location-based applications. But there is an optimized way to provide the ubiquitous geolocation services via exploitation of signals of opportunity (SoOP). The core concept of ubiquitous geolocation and navigation is provide globally available geo-services by giving the mobile terminal the ability to acquire their location information, this technology can be applied at all scales geo-reference by sharing some simple, inexpensive, robust geolocation and navigation algorisms for different technology such as GNSS and other emerging technology, and the goals of the ubiquitous geolocation and navigation service are reliable availability, transparency, seamlessness, awareness, and trustworthiness. SoOP are primarily envisioned to be man-made radio emitters not originally intended for geolocation and navigation, but may be extended to active beacons purposely deployed in an emergency situation, in this paper, we also regarded the signals of different wireless network those defined by the IEEE 802.11, IEEE 802.15 and IEEE 802.16 as an important part of SoOP. The use of widely available, powerful, and economically important SoOP in Hong Kong will provide a robust geolocation and navigation capability. We made some initial investigation into the use of the SoOP through feasibility studies and prototype investigations of the use of wireless local area network (WLAN), ultra-wide band (UWB) and ZigBee.

Keywords: Ubiquitous Geolocation and Navigation, Signals of Opportunity, GNSS, WLAN, UWB, ZigBee

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No. 486

Classification of Land Cover from Remote Sensing Fused Image Based on ICA-SVM and D-S Evidence Theory

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ABSTRACT

Remote sensing image classification is an important means for quantified remote sensing image analysis, and remote sensing image fusion can effectively improve the accuracy of image classification. This paper proposes a classification algorithm of remote sensing fused images based on independent component analysis (ICA), topographic independent component analysis (TICA), support vector machines (SVMs) and D-S evidence theory. Firstly a novel method of fusing panchromatic and multi-spectral remote sensing images is developed by contourlet transform which can offer a much richer set of directions and shapes than wavelet. As independent component analysis not only can effectively remove the correlation of multi-spectral images, but also can realize sparse coding of images and capture the essential edge structures and textures of images, then using features extracted from the ICA and TICA domain coefficients of the fused images, the SVMs are trained to classify the whole fused images. Finally apply the proposed novel D-S evidence combination scheme to make decision fusion for different classification results with different features obtained by SVMs. Experimental results show that the proposed algorithm can effectively improve the accuracy of image classification.

Keywords: Remote sensing image fusion; contourlet transform; independent component analysis; support vector machines; feature Extraction; image classification; D-S evidence theory

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No. 487

Commercial facility site selection simulating based on MAS

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ABSTRACT

The location of commercial facility decides the benefit of the operator to a large degree. Existing location methods can express the static relationships between site selection result and location factors, but there still are some limites when express the dynamic and uncertain relationship between them. Hence, a dynamic, stochastic and forecastable location model should be built which can introduce the customer's behavior into the model and combine the macro pattern and micro spatial interaction. So the authors proposes Geosim-LM based on MAS. Geosim-LM has 3 kinds of agents, CustAgent, SiteAgent and GovAgent. They represent the customers, commercial fercilities and government. The land type, land price and traffic are the model environment. Then Geosim-LM is applied in the bank branches site evaluation and selection in Liwan district, Guangzhou. In existing bank branches site evaluation, there are 70% consistent in score grade between result of Geosim-LM after 200 round runing and actual rebust location. It proves the model is reliable and feasible. The conclusions can be get from the paper. MAS have advantages in location choice than existed methods. The result of Geosim-LM running can powerfully proves that building location model based on MAS is feasible.

Keywords: Commercial facility site selection, MAS, GIS, Simulation

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No. 488

The Study on the Real Estate Integrated Cadastral Information System Based on Shared Plots

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ABSTRACT

Solving the problem of the land property right on the shared parcel demands the integration of real estate information into cadastral management. Therefore a new cadastral feature named Shared Plot is introduced. After defining the shared plot clearly and describing its characteristics in detail, the impact resulting from the new feature on the traditional cadastral model composed of three cadastral features - parcels, parcel boundary lines and parcel boundary points is focused on and a four feature cadastral model that makes some amendments to the three feature one is put forward. The new model has been applied to the development of a new generation of real estate integrated cadastral information system, which incorporates real estate attribute and spatial information into cadastral database in addition to cadastral information. The system has been used in several cities of Zhejiang Province and got a favorable response. This verifies the feasibility and effectiveness of the model to some extent.

Keywords: shared plot, four-feature cadastral model, real estate integrated cadastral information system

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No. 489

A new algorithm and its application about distributed snowmelt concentration model

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ABSTRACT

Based on "3S" (RS, GIS, GPS) technologies and completely distributed design ideas, a new algorithm of the Distributed Snowmelt Concentration Model is designed and built after study the Distributed Snowmelt Runoff Model. It has spatio-temporal features and takes the DEM data, which with high resolution, as a foundation and picks up the hydrological factors, such as slope, gradient, direction of flow, collecting time, drainage network etc., and the algorithm is simple to understand and to implement, requiring only a few tens of code lines and running faster. So the algorithm will be versatile. Meanwhile, a new conception "Period Unit of Time-step" is put forward in this paper, and the algorithm procedure is fully detailed too. After the model applied in the representative study area, Juntanghu Basin, which located in the North-Tianshan Mountains, China, and contrasted with the homologous observed data obtained in the same field, the simulation results show clearly that the Distributed Snowmelt Concentration Model and its algorithm is very good.

Keywords: DEM, 3S, GeoTIFF, Distributed Snowmelt Concentration Model.

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No. 491

Multilingual mapping based on XML-SVG

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ABSTRACT

With the development of geo-informatics, the demands of web mapping services are increasing worldwide. However, these services need to be more accessible and personalized including the ability to display multiple languages in a single interface or a geo-spatial Web Site in terms of 'on-the-fly' map representation and decoration for international visitors. This paper is proposed a multilingual-based approach which a SVG based map is the primary source for preparing a multilingual Web map. According to the basic concepts or principles of map decoration, the paper gives not only an ontological model of map representation and decoration but also indicates clearly that the general issues and main theories and methods of multilingual text on Web mapping. Then, it combines different techniques to decorate the Web map such as SVG specification, four color theorem and line simplification. In order to handle the concurrent hierarchies in geometric context of the map, a geometric view of the solution, a segment tree structure and range-query structure were adapted to solve the issues of text kerning along the curve and multilingual text overlap on one point or coordinate in particular multidimensional or multi-element ones. By the experiments, this approach can be used to implement the spatial query like accessing spatial geometric elements and attributes and it can also be creating maps on-the-fly for multilingual map generalization and integration. Finally, these approaches were implemented and supported to create a software platform called 'Spatial Information Service System' which focus on the integration with multiply sources of spatial information as a disseminating and serving platform for visualizing functionality and generating maps on-the-fly in the context of web mapping applications.

Keywords: multilingual mapping, On-the-fly web mapping, concurrent markup and representing.

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No. 492

A Classification Model of Hyperion Image Base on SAM Combined Decision Tree

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ABSTRACT

Monitoring the Earth using imaging spectrometers has necessitated more accurate analyses and new applications to remote sensing. . A very high dimensional input space requires an exponentially large amount of data to adequately and reliably represent the classes in that space. On the other hand, with increase in the input dimensionality the hypothesis space grows exponentially, which makes the classification performance highly unreliable. Traditional classification algorithms Classification of hyperspectral images is challenging. New algorithms have to be developed for hyperspectral data classification. The Spectral Angle Mapper (SAM) is a physically-based spectral classification that uses an n-dimensional angle to match pixels to reference spectra. The algorithm determines the spectral similarity between two spectra by calculating the angle between the spectra, treating them as vectors in a space with dimensionality equal to the number of bands. The key and difficulty is that we should artificial defining the threshold of SAM. The classification precision depends on the rationality of the threshold of SAM. In order to resolve this problem, this paper proposes a new automatic classification model of remote- sensing image using SAM combined with decision tree. It can automatic choose the appropriate threshold of SAM and improve the classify precision of SAM base on the analyze of field spectrum. The test area located in Heqing Yunnan was imaged by EO_1 Hyperion imaging spectrometer using 224 bands in visual and near infrared. The area included limestone areas, rock fields, soil and forests. The area was classified into four different vegetation and soil types. The results show that this method choose the appropriate threshold of SAM and eliminates the disturbance and influence of unwanted objects effectively, so as to improve the classification precision. Compared with the likelihood classification by field survey data, the classification precision of this model heightens 9.9%.

Keywords: Hyperion image, SAM, Decision tree, Classification

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No. 493

An interoperable Spatial Decision Support System based on geospatial semantic web technologies

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ABSTRACT

Many Spatial Decision Support Systems (SDSSs) have been developed for environmental and natural resources decision-making in recent years. However, an important limitation of the SDSS applications is that they are not interoperable. Several issues prevent the further development of SDSS applications such as the incapability of sharing and reusing existing heterogeneous data and geoprocessing. This paper proposed a framework of web services-based interoperable SDSSs using geospatial semantic technologies such as ontology, web services and service-oriented architecture for decision-making. The proposed interoperable SDSS enables decision-makers to reuse and integrate geospatial data and geoprocessing from heterogeneous sources across the Internet. Based on the proposed framework, a prototype to assist in protective boundary delimitation for Lunan Stone Forest Conservation has been implemented to demonstrate how ontology-based web services and the services-oriented architecture (SOA) contribute to the development of interoperable SDSSs.

Keywords: Spatial decision support system (SDSS), web services, ontology, service-oriented architecture, geospatial semantic web

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No. 494

A Survey on Fuzzy Theory Applied in Geographic Information System

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ABSTRACT

The real world is an infinite complex and very huge systems, the phenomenon and processes in this world have many complex relations among them. It is consecutive and cannot be treated as a determined one as the traditional geographic information system does; What's more, the uncertainty and fuzziness exist in every stage of data processing of GIS, from data collection, data storage to data analysis etc, so it is very meaningful to apply fuzzy theory in GIS for its ability to handle fuzziness and uncertainty of spatial data. The paper talks about the current situation of fuzzy theory applied in GIS, including the classification of application fields, its main methods, principles etc. The detailed fields we concerned include spatial object modeling, spatial reasoning, spatial analysis, spatial data mining, and reliability analysis of GIS data and so on. Furthermore, we put forward some development foregrounds and research orientations of fuzzy theory applied in GIS.

Keywords: Fuzzy theory, spatial object modeling, spatial data mining, spatial reasoning, spatial analysis, GIS

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No. 495

Approach to the Side-scan Sonar Data Storage Based on Spatial Database Technology

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ABSTRACT

Side-scan sonar is a remote sensing technology for submarine geological and geomorphological information detection, which provides acoustic imaging of the bottom at rates of up to several thousand square kilometers a day. How to manage so abundant and tremendous data has become a new problem, urgently needs to be resolved. As side-scan sonar image, also known as sonograph has an inherent geometric distortion which is so-called slant-range effect. Otherwise, the original side-scan sonar image is characterized as an order of scanning lines, without geographical position integrity and scalability. All this requirements and factors are considered and the correction of slant range distortions is outlined. This approach provides a management mechanism of raster catalog for series of sonar images of a surveying zone. Against the efficiency problem of massive image data storage, a spatial database engine is improved from such aspects as tile size setting, image resampling also called pyramid creation and spatial index establishment and so on, so as to enhance performance and improve access rate. The fact is that it archived an ideal response time and is proved to be more effective.

Keywords: Spatial Database Management, Raster Catalog, Side-scan sonar

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No. 499

Automated Keys to Soil Orders Based on Rule Engine

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ABSTRACT

Rule engine technique which is firstly used in business realm because of the quickly changing business environment can be a good solution to the management of geographic knowledge. The objective of this paper is to research how to organize geographic knowledge and reason with rule engine. The rules of Keys to Chinese Soil Taxonomy (3rd edition) are taken as an example of geographic knowledge. The researching results are as follows: (1) Through the review of literature and web resources, we know the advancement of rule engine technique, and finally select NxBRE as the rule engine we use; (2) The rules of keys to Soil Orders are analyzed, and represented in the form of RuleML; (3) Rule customization module and RuleML parsing module are developed; (4) Knowledge base which consists of RuleML files is created with rule customization module, and we finally achieve the goal of automated keys to Soil Orders with NxBRE.

Keywords: Knowledge representation, RuleML, Rule engine, NxBRE, Soil classification, Chinese Soil Taxonomy

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No. 500

Agent-based modeling to simulate the dengue spread

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ABSTRACT

In this paper, we introduce a novel method ABM in simulating the unique process for the dengue spread. Dengue is an acute infectious disease with a long history of over 200 years. Unlike the diseases that can be transmitted directly from person to person, dengue spreads through a must vector of mosquitoes. There is still no any special effective medicine and vaccine for dengue up till now. The best way to prevent dengue spread is to take precautions beforehand. Thus, it is crucial to detect and study the dynamic process of dengue spread that closely relates to human-environment interactions where Agent-Based Modeling (ABM) effectively works. The model attempts to simulate the dengue spread in a more realistic way in the bottom-up way, and to overcome the limitation of ABM, namely overlooking the influence of geographic and environmental factors. Considering the influence of environment, *Aedes aegypti* ecology and other epidemiological characteristics of dengue spread, ABM can be regarded as a useful way to simulate the whole process so as to disclose the essence of the evolution of dengue spread.

Keywords: geosimulation, agent-based model, dengue, disease spread

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No. 501

Copyright Protection for GIS Vector Data Production

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ABSTRACT

Limited by the characters of GIS vector data, such as variety and complexity of expression, universality, mass, disorder and pretty good privacy, etc., the traditional copyright protection methods for image and audio productions cannot be applied into GIS vector data productions directly. In this paper, a solution to copyright protection of GIS vector data productions is proposed. Firstly, information characteristics, data organization and storage characteristics and attack characteristics of GIS vector data are comprehensively analyzed. Secondly, based on hash, file filter driver, dynamic encryption and decryption, the key techniques including zero-watermarking generation, access control, and data content protection are described. Finally, an copyright protection frame of GIS vector data is put forward.

Keywords: Geographic Information System, Vector Data, Copyright Protection

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No. 502

Visualization Analysis Based On Cell Complex for 3d GIS

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ABSTRACT

As the theory and application requirement of 3d GIS are developing dramatically, 3D geological simulation is not only limited in the capability of visualizing spatial objects, and it has a deeper demand on three dimensions spatial analysis for geographic objects or phenomenon. Therefore, a lot of visualized analysis functions for practical projects are proposed by researchers. However, these researches usually come up with corresponding algorithms based on certain data model or data structure which is without a powerful portability. And the algorithms are often limited to specific requirement which has little expansibility. To solve this problem, a new 3D GIS data model for 3D geological simulation is advanced based on cell complex theory and correlative research results in the field of non-manifold geometric modeling. And a series of 3D set operators are defined to carry out virtual drilling, virtual cutting, virtual digging and virtual tunnel excavation analysis and so on. Compared with existing implementations, the new presented 3D GIS data model unifies the expression of wire frame, facial and volumetric model, which ensures the portability of algorithm. Set operators based on non-manifold geometric modeling possessing mathematical completeness have the ability to implement arbitrary geometric object operation, which can insure the expansibility of the algorithm.

Keywords: 3D geological simulation, 3D interactive analysis, 3D spatial data model, cell complex, set operation

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No. 503

Variational method of speckle reduction and boundary detection in SAR imagery

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ABSTRACT

Synthetic Aperture Radar (SAR) images have been widely used in remote sensing applications. However, the SAR image contains speckle noise. In this paper, we propose a variational method to delineate the boundary of objects in SAR images. It is implemented by two steps: The first step is speckle reduction and the second step is boundary detection. The two steps are implemented with a unified frame of energy minimization. In each step, we define an energy functional, and the corresponding minimizer of the functional is regarded as the result. An ERS-2 PRecision Image (PRI) over Proserpine area in Australia is used to demonstrate the algorithm. The results of both steps appear to be very promising.

Keywords: SAR, variational method, image decomposition, Chan-Vese model

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No. 504

Formal Representation of Geographic Ontology and Its Application in Map Services

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ABSTRACT

Geographic ontology is a very complex and intricate concept. As a philosophical concept, ontology has the most ambiguous meanings. In the paper, firstly the concept of geographic ontology is explored and the three meanings of geographic ontology are put forward: philosophy ontology, information ontology and spatial ontology. Then it introduces some ontology representation languages and concludes by suggesting OWL as the appropriate language for building geographic ontology. But geographic ontology is quite distinct from the general information ontology in that it should represent spatial properties as well as attribute properties. Unfortunately, OWL cannot describe spatial properties and spatial relations of geographic ontology because they are mainly for representing the general information ontology. It puts forward to build some formal axioms about spatial properties of geographic ontology by use of three theoretical tools: mereology, location theory and topology. With these axioms, we can formally represent geographic ontology with spatial properties. Finally, it shows how we can use geographic ontology to describe map services and to improve the quality of map services.

Keywords: Geographic ontology, OWL, formal representation, theoretical tools, map services

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No. 506

Modeling Urban Growth with Geographically Weighted Multinomial Logistic Regression

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ABSTRACT

Spatial heterogeneity is usually ignored in previous land use change studies. This paper presents a geographically weighted multinomial logistic regression model for investigating multiple land use conversion in the urban growth process. The proposed model makes estimation at each sample location and generates local coefficients of driving factors for land use conversion. A Gaussian function is used for determine the geographic weights guarantying that all other samples are involved in the calibration of the model for one location. A case study on Springfield metropolitan area is conducted. A set of independent variables are selected as driving factors. A traditional multinomial logistic regression model is set up and compared with the proposed model. Spatial variations of coefficients of independent variables are revealed by investigating the estimations at sample locations.

Keywords: geographically weighted multinomial logistic regression, land use conversion, urban growth, GIS

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No. 507

The Application of High Spatial Resolution Remote Sensing Image for Vegetation Type Recognition in Dagou Valley

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ABSTRACT

This paper present a detail processing procedure about SPOT5 image applied for vegetation type recognition, and determines the capacity of high spatial resolution satellite image data to discriminate vegetation type in a complex ecosystem. A high spatial resolution SPOT5 image, captured in April 2005, and coincident field data covering the Dagou valley, was used in this analysis. Image geometric rectification and image fusion are then introduced to take prepare for classification. Subsequently, a maximum likelihood classification algorithm was applied to the SPOT5 image data to map the vegetation classes. Field validation and accuracy assessment are crucial to ensure the reliability of classification results. The strategy of field work and the resulting accuracy evaluations were presented, and yielded the high classification accuracy (overall accuracy=83.86%, Kappa=80.23%). The result showed that the information on vegetation types can be mapped effectively from high spatial resolution satellite image data.

Keywords: high spatial resolution, remote sensing, SPOT5, MLC

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No. 510

Research on Public Logistics Centers of Zhenzhou City Based on GIS

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ABSTRACT

The regional public logistics center (PLC) is the intermedium that transports goods or commodity from producer to wholesaler, retailer and end consumer through whole supply chains. According to the Central Place Theory, the PLC should be multi-centric and of more kinds of graded degrees. From the road network planning discipline, an unique index---Importance Degree, is presented to measure the capacity of a PLC. The Importance Degree selects three township criteria: total population, gross industry product and budget income as weights to calculate the weighted vectors by principle component analysis method. Finally, through the clustering analysis, we can get the graded degrees of PLCs. It proves that that this research method is very effective for the road network planning of Zhengzhou City.

Keyword: GIS, public logistics center (PLC), graded system, importance degree, clustering analysis

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No. 511

Extending a Geocoding Database by Web Information Extraction

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ABSTRACT

Local Search has recently attracted much attention. And the popular architecture of Local Search is map-and-hyperlinks, which links geo-referenced Web content to a map interface. This architecture shows that a good Local Search not only depends on search engine techniques, but also on a perfect geocoding database. The process of building and updating a geocoding database is laborious and time consuming so that it is usually difficult to keep up with the change of the real world. However, the Web provides a rich resource of location related information, which would be a supplementary information source for geocoding. Therefore, this paper introduces how to extract geographic information from Web documents to extend a geocoding database. Our approach involves two major steps. First, geographic named entities are identified and extracted from Web content. Then, named entities are geocoded and put into storage. By this way, we can extend a geocoding database to provide better local Web search services.

Keywords: Information Extraction, Geographic Information, Local Search, Geocoding

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No. 512

Robust Smooth Fitting Method for LIDAR Data Using Weighted Adaptive Mapping LS-SVM

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ABSTRACT

In many spatial analyses and visualizations related to terrain, a high resolution and accurate digital surface model (DSM) is essential. To develop a robust interpolation and smoothing solutions for airborne light detection and ranging (LIDAR) point clouds, we introduce the weighted adaptive mapping LS-SVM to fit the LIDAR data. The SVM and the weighted LS-SVM are introduced to generate DSM for the sub-region in the original LIDAR data, and the generated DSM for this region is optimized using the points located within this region and additional points from its neighborhood. The fitting results are adaptively optimized by the local standard deviation and the global standard deviation, which decide whether the SVM or the weighted LS-SVM is applied to fit the sub-region. The smooth fitting results on synthesis and actual LIDAR data set demonstrate that the proposed smooth fitting method is superior to the standard SVM and the weighted LS-SVM in robustness and accuracy.

Keywords: Support vector machine, weighted least squares SVM (LS-SVM), light detection and ranging (LIDAR), digital surface model (DSM), adaptive optimization

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No. 513

IBMDCH: Illegal Building Monitoring in Digital City based on HPC

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ABSTRACT

Every year city planners spend a large amount of money and time to monitor illegal buildings by officials on site. In this way, all illegal buildings in a city can be identified in about 2 years. Due to such slowness, some city planners ask experts to look for illegal buildings by interpreting remote sensing image. By using this approach, the illegal buildings can be found out in about 6 months. Considering the high cost of human resource, some city planners start to use computer as an aid to the experts. In the way, the illegal buildings can be found out in about 2 months. Still, the cost and the time can not satisfy the need for large-scale city monitoring. In order to realize automatic and fast building monitoring, we propose IBMDCH (Illegal Building Monitoring in Digital City based on HPC), in which all illegal buildings in a city can be found out in several minutes by comparing buildings-image or buildings change image with the official city planning graph of a digital city based on HPC (High Performance Computing).

Keywords: illegal building, monitor, digital city, HPC

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No. 514

Impacts of Land Use and Climate Change on the Net Primary Productivity in XinJiang Based on Remote Sensing

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ABSTRACT

Arid and semi-arid ecosystems exhibit a spatially complex biogeophysical structure. According to arid western special climate-vegetation characters, using the remote sensing spectral mixture analysis. The study developed a modified production efficiency model Net Primary Productivity-Geography Processing Ecology Model (NPP-GPEM) appropriate for the arid area at regional scale based on the concept of radiation use efficiency. Combined with recent historical period climate data and two periods of land use data sets from remote sensing data, we test the net primary productivity (NPP) data sets over last 20 years in XinJiang of the North China modelled by the NPP-GPEM with the satellite data-driven for detecting the wide spread spatial temporal characteristics of the impacts of climate and land use change impact with the regional NPP. Our results shows that over past 20 years, the average annual temperature in the research region has remarkably increased by more than 0.056°C, but over the same period, there has been a 0.635mm increase in annual precipitation and increase in NPP by an annual rate of 0.142TgC. Taking use of 16 land covers of Xinjiang which was carried on the calculation of the matrix transfer, the study got the matrix of the NPP changes over past 20 years. The result found that the quicker trend increasing is the others woodlands (the 5.51gC/m2/yr) and the oasis farmland (4.32 gC/m2/yr). The pasture area is the biggest to about 29.3% of total area, the pasture growth is smaller than others, but its increase to the contribution rate of the annual NPP in the whole land ecosystem system biggest is pasture and agricultures to land use covers, that had the total annual NPP increase with 52.2% and 19.9% of the quantity respectively, the plant cover is only the shrub

pant which has a absolute decrease ecosystem system in the type (-14.39gC/m2); In fine, the paper mainly reveals the dissimilarities and conversion among the pasture, farmland, woodland and different covered pasture and other types. The correlation analysis between annual NPP and annual precipitation was highly consistent with plant cover spatially (R2=0.64, P<0.01) in the overall XinJiang, and the northern of XingJiang is better than the southern of it, and the correlation coefficient changes with the changes of vegetation types and different regions. The analysis revealed that the climate changes dominate the impacts on the NPP in the whole study region. However, land use plays a dominative role in the areas with land cover changes. Over past 20 years, the NPP in the whole study region remarkably increased due to obvious precipitation decrease and temperature rise. Between two periods of land use (about 10 years), the changes in climate are predicted to cause increases in NPP, and combined impacts of climate changes and land use to cause to increase in NPP.

Keywords: climate change, plant cover, NPP, XinJiang, remote sensing

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No. 516

The method study of building grid standard land price based on Thiessen polygon interpolation method

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ABSTRACT

Most cities in China have adopted graded land price to represent standard land price so far, while others have employed route price and district price. All of the methods mentioned above only show the average price in a region, which are not easy for the public to understand. The emergence of grid standard land price enhances the publicity, simplifies the process of parcel evaluation and lessens the extent of artificial interference. There are two methods to generate grid standard land price. Firstly, all grid point standard prices are calculated by establishing the relationship between the land price and graded score. This relationship can be obtained through regression analysis of graded results and the sample land price. The second method is DEM-based numerical surface rebuilt technique. It is a 3D grid model established by spatial interpolation among monitoring samples acquired by collecting market exchange price samples and the samples from land price monitoring survey. Considering the characteristic of Guangzhou City, this paper provides a method to generate grid standard land price based on Thiessen polygon interpolation method and compares it with other interpolation methods to prove its effectiveness.

Keywords: Thiessen polygon interpolation method, grid standard land price

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No. 517

A Study on 3D Modeling of Building Based upon Photogrammetry

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ABSTRACT

This article has analyzed three-dimensional city building modeling demand based on photogrammetry and the photogrammetric method in the building's three-dimensional reconstruction and the three-dimensional urban building data updating aspect superiority. It has also discussed three-dimensional urban building modeling method, the workflow and the technology based on the photogrammetry, and finally achieved high accuracy in three-dimensional reconstruction of both wide range city buildings and a single complex building.

Keywords: Cyber City; photogrammetry; 3D Urban Building Model; Error; Quality Control

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No. 518

The Research on the Negative Influence of Real Estate Over-exploitation in Urban Waterfront to Urban Ecological Environment and the Countermeasures

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ABSTRACT

Based on the overexploitation of real estate in urban waterfront the paper elucidates the result of its negative influence to urban ecosystem and evolvement, we take Nanjing as an example, point out overexploitation of real estate is the main factor of accelerating the problems of 'aquatic ecosystem', 'water evolvement', 'landscape' and 'urban heat island', discuss the countermeasures to the problem, point out the importance of legislation and planning as well as the importance of constructing urban-wide 'aquatic ecosystem' and intensifying education and propagandism, provide some measures in public opinion supervision, and emphasize government should play the leading function in the whole process.

Keywords: urban waterfront, over-exploitation of real estate, ecosystem, environment, negative influence, countermeasures, Nanjing

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No. 519

Study on the Spatial Extension and Distribution of Industrial Land in Tangshan Based on RS and GIS

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ABSTRACT

The great changes in quantity and distribution of industry land of Tangshan city have taken place with the industrial boosting and shifting of Beijing-Tianjin district, especially the industry transferring toward coastal areas in Hebei Province. Study on the industrial land distribution, spatial pattern and expanding mode will help to establish rational land use planning and control the industrial land scale. RS and GIS were integrated to detect land use change and reveal the increase origin of industry land between 1993 and 2003. The indicators of barycenters transformation and landscape index were computed to present the spatial extension of industrial land in Tangshan city. The result shows that the scale of industrial land increased continuously from 6954.6 hm^2 to 8177.6 hm^2 by cultivated land transformation. The structure barycenter of industrial land moved 0.68 km westward and 0.24 km northward respectively. With industrial land patch increasing from 108 to 131, fractal dimensions and broken degree increased from 1.049 to 1.058 in ten years, and average patch area decreased from 62.82 hm^2 to 55.61 hm^2. Finally an industrial land spatial distribution mode was put forward based on the development stage and industrialization levels in Tangshan city.

Key words: Industrial land; Spatial extension; Mode; Tangshan

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No. 521

A Spatial Indexing System for Visualizing Database

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ABSTRACT

The XML-enabled Spatial Visualizing Database can be widely used because of its high security and convenience of management. It is often implemented by relational databases. But, these databases can't index points, curves and surfaces separately based on their characteristics. In addition, the indexing systems of these databases are not capable of creating the function of indexing on a wide range of relational databases. These limitations were solved by the following two steps in the paper. Firstly, referring to the SVG spatial expressional model, bring up a solution to index points, curves, and surfaces separately with different algorithms. Secondly, elaborately design a spatial indexing system with high cohesion and low coupling by using three design patterns: Template Method, Bridge and Adapter. Eventually, our system has three achievements: 1) separately index points, curves and surfaces with different algorithms catering for the users; 2) index SVG visualizing data on heterogeneous relational databases; 3) many of the open-source spatial indexing projects can be used in this system after modifying some codes. Experiments have been carried out to prove the conclusions mentioned above.

Keywords: SVG visualizing Database, spatial indexing system, design patterns

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No. 522

Valuing Agriculture Land Standard Prices Based on Agriculture Land Gradation and Evaluation Information System (ALGEIS)

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ABSTRACT

Agriculture land is the most fundamental material of production, and is man's indispensable living condition for existence. Agricultural land prices reflect not only the uses of agricultural land, but the potential uses as well. This paper reviews the valuation on agricultural land prices in western developed countries and the development courses of agricultural land appraisal, especially valuation on agricultural land standard prices in China. The problems in the valuation at present are analyzed. According to the thinking of "first gradating and then evaluating", "Agriculture Land Gradation and Evaluation Information System" (ALGEIS) based on Geographical Information Systems (GIS) is developed. As a case study, the proposed method is applied to value agricultural land standard prices in Yunan County, Guangdong Province, China. The case study shows that the proposed method is a practical and satisfactory one. The applications of achievements of valuation on agricultural land prices are discussed, which effectively promote the reform and development of land resources administration. Developing agriculture land gradation and evaluation information system based on GIS, can satisfy spatial, dynamic, quantitive and comprehensive requests in valuation on agriculture land.

Keywords: agricultural land; standard prices; geographical information systems; gradation; evaluation; valuation

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No. 523

A Solution to Grid Technology for Spatial Information Service

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ABSTRACT

As an integration of Grid technology and spatial information technology, spatial information multi-grid (SIMG) is presented to solve the obstacles and inconveniences for sharing and services of global spatial information caused by traditional GIS in this paper. Through a brief introduction of the fundamental infrastructure and key technologies of SIMG for service, it is easily to find that with the strong information intercommunication and collaborative working capability of Grid technology, all resources of urban information infrastructure can be integrated together and applied effectively; By dynamic subdivision technology, urban district can be divided into seamless multilayer cells; by self-adaptive index and quality evaluation procedure of coordinate transformation, various data merging or integration from GIS, GPS and RS will satisfy the specified precision, so smart service and LBS can be really achieved. At last, a prototype system is cited to verify its feasibility and validity.

Keywords: Grid technology, SIMG, urban, coordinate transformation, service

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No. 524

A QoS- based WSRF Service Scheduling Mechanism in Spatial Data Grid

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ABSTRACT

Spatial Data Grid is an ideal environment to handle the data-intensive and computing-intensive geo-spatial processes. In this heterogeneous and distributed environment, the requirements of service scheduling are dynamic and diverse. Therefore, an appropriate scheduling mechanism should be adopted, which would be able to deal with the resources properties of a grid environment, such as the data size, network capabilities, and the capabilities of processors, and meet the need of specific GIS (Geographic Information System) applications. This paper proposes a scheduling mechanism based on utility of Quality of Service (QoS). And, this scheduling mechanism, wrapped into a standard WSRF service, provides a transparent way to select the appropriate spatial data service providers in a dynamic spatial data grid and hides the complexity of the scheduling strategy from users to coordinate those required services. Experiments show that our scheduling mechanism can provide services selection and performance guarantees and lead to better spatial resource sharing and significant service performance.

Keywords: QoS, Spatial Data Grid, WSRF service, scheduling mechanism

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No. 525

3D modeling of terrace in the Loess Plateau

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ABSTRACT

With the development of 3DGIS and virtual geographic environments, it is important and necessary to represent terrain in a more vivid form but keep geographic information precise too. At present, there is less study on the 3D representation of micro-landform in comparison with large scale 3D modeling of terrain. Regarding the building of a simulation environment that reflects the real situation of the Loess Plateau, it's necessary to consider the features of micro-landform. This paper aims to explore the way of building 3D model of terrace in the Loess Plateau, which is a typical landscape in the region. According to the characteristics of terrace, level terrace, the most common type, is considered as a modeling object and a new method of feature based TIN (Triangular Irregular Network) modeling is put forward. Two key techniques regarding the method are terraces' feature extracting and the obtaining of object's elevation of points in each feature line to make TIN interpolation.

Keywords: digital elevation model, terrace, 3-D landform model, virtual geographic environments, feature extraction

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No. 526

An Interactive-Iteration method for deriving Ocean Color Factors using Remote Sensing

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ABSTRACT

In the remote sensing detection of the ocean color factors near seacoast, the spectral signal of water includes other spectral information, such as suspended matter, colored dissolved organic matter (CDOM), chlorophyll and so on. Each component has its specific spectrogram, and they are overlapped and hard to separate, which affect the precision of remote sensing retrieval model obviously. Considering the high correlation between chlorophyll and suspended matter, we proposed a new method based on the interactive iteration to estimate concentration of chlorophyll and suspended matter. Compared with single-factor-retrieval models, the precision of chlorophyll-iterative model increases from 68.312% to 77.47%, the precision of suspended matter-iterative model increases from 86.60% to 92.04%. Finally, the proposed method is applied to the SeaWiFS images for obtaining the chlorophyll and suspended matter distribution map of Pearl River. Compared with the investigation and study of other scholars, they have the same trend of distribution. All of results showed that this iterative model could be used to estimate the concentration of chlorophyll and suspended matter in the Pearl River effectively.

Key words: iterative method; optimization; case-2 water; ocean color factors

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No. 527

Semi-supervised classification for hyperspectral remote sensing image based on PCA and kernel FCM algorithm

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ABSTRACT

Hyperspectral remote sensing image classification is a challenging task in remote sensing applications because this image always has some information redundancy and is easy to be affected by noise or lack of the separability. A semi-supervised classification method based on principal component analysis (PCA) method and kernel fuzzy C-means (KFCM) algorithm for hyperspectral remote sensing image is proposed in this paper. First the PCA method finds an effective representation of spectral signature in a reduced dimensional feature space. Then a semi-supervised kernel-based FCM algorithm, called SSKFCM algorithm by introducing semi-supervised learning technique and the kernel trick simultaneously into conventional fuzzy C-means algorithm, is introduced to classify the feature vectors. Finally numerical experiments are conducted on a hyperspectral remote sensing image that provides digital images of 80 spectral bands with wavelength rang from 455 nm to 1642 nm. Classification performance is estimated by classification accuracy and kappa coefficient. The simulation results show that the proposed approach can be effectively applied to hyperspectral remote sensing image classification.

Keywords: semi-supervised kernel-based FCM algorithm, kernel fuzzy C-means algorithm, fuzzy C-means algorithm, principal component analysis, semi-supervised classification, kernel trick, Gaussian kernel function, image classification

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No. 529

A Problem-oriented Approach for DEM Data Management and Manipulation

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ABSTRACT

For the last decades, GIS software technologies have made tremendous development and applied to many special fields when their targets are relevant to geographical locations. But the basis of cartographic mapping of GIS is a restriction for more development in GIS data modelling, storage and manipulation. Recently, much attention is being paid on ORDBMS(Object Relational Database Management System) to represent and manage GIS Data. New approaches have earned acceptance in many research communities and several proposals have emerged in commercial software for solving the management and manipulation on GIS vector data. Though the storage and management of field-based model data(e.g. raster, DEM, TIN) have got less achievement and people still use files and procedural ways to manipulation field-based GIS data in common applications. In this paper a new structure model using ORDBMS technology for field-based data's storage and management was proposed on the basis of full discussion on several GIS data management technologies, then a problem-oriented approach for DEM data management and manipulation was designed and implemented through open source software systems PostgreSQL and Python language. Experimental examples of different DEM data souces were stored, managed and used by using the extended spatial database system. The experiments illustrated that this solution would be a useful supplement to spatial database and it provided an effective way to DEM data management and analysis, and support the interoperability between vector data and field data.

Keywords: GIS, Spatial Database, ORDB-based Extension, Field-based application, Spatial Query Language

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No. 530

An Urban-Rural Spatial Development Planning Platform Using GIS

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ABSTRACT

Over the past ten years, the development of urban planning support systems has made remarkable progress, yet most of urban planning support systems based on GIS do not readily fit the changing professional requirements of the urban-rural spatial development planning because they are far too generic, complex, inflexible and incompatible with most spatial development planning tasks. Accordingly, how to effectively build up a platform orienting towards planning tasks and planners rather than technology itself by using GIS is still a challenge. The research in this paper analyzes the status quo of urban-rural spatial planning technological system and methodology and proposes the idea of design, development and application of urban-rural spatial development planning platform (URSDPP) based on the GIS technology. The methodology and key technologies needed for building URSDPP are discussed. The logical framework and software modules are illustrated which clearly manifest how GIS work together with other technologies. Three case studies are introduced which proves the advancement, reliability and suitability of URSDPP.

Keywords: Urban-Rural Spatial Development Planning Platform, Urban-Rural Planning, Geographical Information System (GIS), Geoinformatics

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No. 531

GIS-based Approaches for Planning Support

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ABSTRACT

Along with the development of Digital City and its practical applications, various urban geographic information systems (UGIS) has contributed enormously to the government's information services and decision-making process. However, the data redundancy has become a practical issue, which makes planners difficult to derive required data effectively from a large amount of data from UGIS databases. Based on comparison of the planning support system (PSS) with other UGIS, requirements of planning support based on GIS is discussed. Aiming at providing effective data and methods for urban planning, the paper explored GIS-based approaches for planning support in which spatial analysis played an important role and put forward a technological model to analyze urban problems in a dynamic environment to provide ideas and hints for further development of urban planning theories and practice.

Keywords: Planning support system; GIS; Spatial analysis

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No. 532

Study on Spatio-Temporal data model of forest resource

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ABSTRACT

The historical information could be managed by TGIS which has not been applied in the forest resource management. The Spatio-temporal data model is the core of TGIS. By referencing from several existing Spatio-temporal Data Models and analyzing the characteristics of the forest resources data, this paper proposes a new Spatio-temporal Data Model of forest resource named "multi base states model based on feature and event". It is proven efficient in managing and retrieving the forest historical information.

Keywords: Spatio-Temporal Database; forestry resource; feature; event; multi base states

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No. 535

Sample manuscript showing specifications and style

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ABSTRACT

Begin the abstract two lines below author names and addresses. The abstract should concisely summarize key findings of the paper, and should consist of a single paragraph containing no more than 200 words. The abstract does not have a section number. A list of up to 10 keywords to use in online content search should immediately follow. Text paragraphs are single-spaced.

Keywords: Times Roman, image area, acronyms, references

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No. 537

Design and Realization of Tourism Spatial Decision Support System based on GIS

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ABSTRACT

In this paper, the existing problems of current tourism management information system are analyzed. GIS, tourism as well as spatial decision support system are introduced, and the application of geographic information system technology and spatial decision support system to tourism management and the establishment of tourism spatial decision support system based on GIS are proposed. System total structure, system hardware and software environment, database design and structure module design of this system are introduced. Finally, realization methods of this systemic core functions are elaborated.

Keywords: GIS, tourism, spatial decision support system

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No. 538

Quantitative Study on Spatial Distribution of Geospatial Industry in China

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ABSTRACT

Study on spatial distribution of geospatial industry is essential for industrial layout. By choosing the typical industry index for each industrial branch, sorting, scoring and calculating by weight, this paper calculates out the value of spatial distribution index for each province which quantitatively reflects the status of spatial distribution of geospatial industry in China. According to the index value, five levels of provinces are divided: the leading provinces, the well-developed provinces, the better developed provinces, the developing provinces and the under-developed provinces. Furthermore, the paper analyzes the spatial diffusion process of the geospatial technology in China, as well as the influence factors for each industry branches, and try to find out the reason of the current status of spatial distribution in China.

Keywords: Geospatial industry, surveying and mapping industry, GIS industry, RS industry, GNSS industry, spatial distribution

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No. 539

Evaluating spatial equity of health service in Minhang District, Shanghai

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ABSTRACT

Assuring equitable health service is an important factor for promoting sustainable development and constructing harmonious society. Its concept is very necessary for policy makers and health planners. Recent advances in the field of health geography have greatly improved our understanding of the role played by equitable geographic distribution of health services. But equity is difficult to operationalize because it is influenced by lots of non-spatial factors. This paper presents a notion that analyzes spatial equity of health service integrating theories and techniques of spatial accessibility and GIS. By means of modified spatial accessibility index, the authors analyze relative equity status of each subdistrict based on geo-referenced and socio-demographic census exemplified by Minhang District of Shanghai. Due to the demand of residents and using efficiency of every health service are added in the method of accessibility, it makes equity research more valid. The paper also discusses the influence of floating population on spatial equity of health service.

Keywords: Spatial equity, accessibility, geographical information system, health service

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No. 540

Parallel Optimization of IDW Interpolation Algorithm on Multicore Platform

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ABSTRACT

Due to increasing power consumption, heat dissipation, and other physical issues, the architecture of central processing unit (CPU) has been turning to multicore rapidly in recent years. Multicore processor is packaged with multiple processor cores in the same chip, which not only offers increased performance, but also presents significant challenges to application developers. As a matter of fact, in GIS field most of current GIS algorithms were implemented serially and could not best exploit the parallelism potential on such multicore platforms. In this paper, we choose Inverse Distance Weighted spatial interpolation algorithm (IDW) as an example to study how to optimize current serial GIS algorithms on multicore platform in order to maximize performance speedup. With the help of OpenMP, threading methodology is introduced to split and share the whole interpolation work among processor cores. After parallel optimization, execution time of interpolation algorithm is greatly reduced and good performance speedup is achieved. For example, performance speedup on Intel Xeon 5310 is 1.943 with 2 execution threads and 3.695 with 4 execution threads respectively. An additional output comparison between pre-optimization and post-optimization is carried out and shows that parallel optimization does to affect final interpolation result.

Keywords: multicore processor, parallel optimization, IDW interpolation, OpenMP

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No. 541

Research on Visual Modeling for Geospatial Services Composition

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ABSTRACT

Web services and web service composition technology have become the primary methods to realize geospatial information sharing and interoperability. There are various integration models and many specifications for web services composition, BPEL4WS is the most typical and prevailing one. But BPEL4WS is IT-oriented, the syntax structure is complicated, a well understanding to XML specifications and web services specifications is demanded, the way to describe processes and define activities in BPEL4WS are different from ways in certain domain, service contracts need early binding before the process instance execution. For above reasons, BPEL4WS is not suit for geospatial processing process's visual modeling. In this paper, an abstract geospatial service chain model based on data-dependent relationship is designed. A mapping algorithm is also proposed for translating the abstract service chain model into BPEL4WS form. So geospatial experts who are not web services experts can intuitively modeling service chain, translate the model into BPEL4WS style and execute it using BPEL4WS engine. Based on these researches, a geospatial web service chain visual modeling platform prototype is built, aiming to meet modeling demand of geospatial domain experts and common users.

Keywords: Services Composition; BPEL; Web Services; Geospatial Services; Visual Modeling; Service chain

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No. 542

A study on spatial structure of urban system in the Northern China Plain based on radar remote sensing image

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ABSTRACT

Differing from optical remote sensing image, radar remote sensing image can be used to extract more useful information, and its application is becoming widespread in a variety of fields. Based on the central place theory, the spatial structure of urban system in the Northern China Plain is studied by using Radarsat ScanSAR mosaic image. The results show that: (1) Radarsat ScanSAR data are suitable for automatic extraction of building-up areas and has meaningful potential for urban geographic study. (2) The urban system in the Northern China Plain, which is deeply influenced by physical factors, especially hydrographic factors, can be divided into five categories: urban system of equal distance between central places on fluvial fan region at Mt.Taihangshan; hexagonal urban system in central part of Hebei flood plain; pentagonal urban system in the Yellow River fluvial fan; quadrilateral urban system in the vicinity of Huaihe River system; and scattered new towns in the places of rolling hills in central and southern areas of Shandong Province. (3) An evolution model of central place system from hexagon to pentagon and quadrangle influenced by river is suggested. (4) No matter hexagonal or pentagonal urban systems, this study has demonstrated that there are good relationship between the distance structure model of the central place and the real-life instance.

Keywords: Radar remote sensing image, Northern China Plain, urban system, spatial structure

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No. 543

Occlusion detection analysis based on two different DSM models in true orthophoto generation

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ABSTRACT

The traditional orthophoto rectification often suffers from the problems of building lean and double mapping, etc., which are caused by no detecting the occluded areas , therefore , many improved occlusion detection methods had been discussed to solve these problem ,such as angle and height based ray tracing method, angle-based method and Z-buffer method, etc. Angle and height based ray tracing method based on two different DSM models will be discussed in this paper, Experimental results demonstrate that the accuracy based on TIN DSM is better than that based on dense grid DSM.

Keywords: True orthophoto, occlusion detection, double mapping, TIN DSM, grid DSM\

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No. 544

Land Use/Cover Changes between 1990 and 2000 based on Remote Sensing and GIS in Pearl River Delta, China

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ABSTRACT

In recent decades, land use/cover change and its consequences have been an important aspect of geography, ecology, environment science and global change. The Pearl River Delta lying on the mouth of the Pearl River, South China, is an important ecostone between sea and river, terrestrial and hydrology. Since 1990, Land use/cover has changed greatly due to the rapid urbanization in the Pearl River Delta. Farmland area decreases 1414.75km^2 from 13504.1 km2 to 12089.35 km^2, the proportion to total land area decreases from32.82% to 29.35%. Forestland area decreases 904.26 km^2 between 1990 and 2000. Built land area increases rapidly, in 1990, the area of built land is 1849.60 km2, while in 2000, the built land area reaches 4427.03 km^2, and the increased area is 2577.43 km^2. The area of water land, idle land and wetland decrease 55.72 km^2, 141.47km2 and 14.12 km2 respectively. The transition intension of LUCC is unprecedented, about 25.26% area of total Farmland has involved in this conversion, among this conversion, the change area of farmland converts to built land, water land, forestland, wetland, idle land are 1876.40 km^2, 1175.61 km^2, 315.83 km^2, 31.13 km^2 and 12.01 km^2, respectively, the immigrated area is 3410.98 km^2, and emigrated area is 1994.82 km^2, most of those land use area loss convert into built land. The immigrated area of other land use to built land in turn is: Farmland >water land >forestland > wetland >idle land, and emigrated area of built land to other land use in turn is as: Farmland>forestland>water land> wetland>idle land. Idle land change intension reaches 80%.The dynamic index indicates that these cities (eg. Zhongshan) are associated with the most land use/cover change process. The cities of Jiangmen, Zhaoqing and Huizhou have lower values of the index. These changes coincide with the land use conversion process, which can reflect the urban and economic development.

Keywords: Land Use/Cover Change (LUCC); Dynamic index; Pearl River Delta (PRD); Remote Sensing; GIS

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No. 545

Endmembers extraction of wheat based on time series of MODIS-NDVI and TM samples data

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ABSTRACT

Knowledge of the area and distribution of cropland is important for land management and land security. Low spatial resolution imagery is one of the important remote sensing data source in the study of the large extent cropland. There exist many mixed pixels and effective method that should be improved to deal with them. In this paper, linear mixing model was used to unmix the time series of MODIS-NDVI data. The emphasis was the identification and extraction of endmembers, which represent the spectral characteristics of the single pure land cover types. A new endmembers extraction algorithm based on the temporal series of MODIS-NDVI and TM sample data was presented in this paper. We used the effective endmembers to linear spectral mixture model to achieve the wheat area in the study area. Regarding the classification of TM as the reference data, we evaluated the classification results and found wheat distribution's region accuracy and pixel accuracy reach to 92.9% and 0.837 respectively, which were higher than the clarification result based on the endmembers from MODIS-NDVI pixel purity index analysis or from classifications of TM data. This shew that our endmembers extraction algorithmwas available and effective, which helped to improve monitoring accuracy of large scope and distribution of vegetation.

Keywords: Endmembers extraction, linear spectral mixture modeling, MODIS, TM samples

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No. 546

Comparison of land cover classification methods based on single-temporal MODIS data

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ABSTRACT

Based on single-temporal MODIS data of Gansu province, mainly using its spectra information, three classifiers – the Maximum likelihood, BP neural network and decision tree based on data mining software See 5.0 are applied in the Land cover classification research. The validated results show that decision tree algorithm has the best performance of extraction with an overall accuracy of 82.13 percent, followed by the BP network algorithm, and that of the maximum likelihood classifier is worst; the accuracy of low vegetation area is improved with the indexes of TVA and TVD; Data mining software of See 5.0 with boosting technique can build decision tree quickly and improve the precision of miscible classes.

Keywords: Land Cover Classification; MODIS; Maximum likelihood classifier; BP neural network classifier; Decision tree classifier; TVA′; TVD; See 5.0

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No. 548

The Analysis of Land Use Spatial Patterns Responded to Different Geomorphology Type: Two Cases Studies in Hubei Province, China

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ABSTRACT

Land use spatial pattern reflects both the impact of human activities on the process of ecological system and the human activities response to natural condition. Geomorphology condition, which has a close relationship with land use spatial pattern, is a direct and key factor influencing human to use land at the local level. This paper analyses two cases of land use spatial patterns in Hubei province China, Zigui County and Jiayu County, which are exemplary for two different geomorphology conditions, respectively the mountain area and plain model. The land use spatial pattern is analyzed using geographical information system (ArcGIS) and landscape-pattern analysis software (FRAGSTATS 3.3). The results indicate that different land use type has different landscape characteristics. Simultaneity, the same land use type forms different landscape pattern in the dissimilar geomorphology region. Terrain feature, which restrains the possible land use type, is the base for people to decide how to use the land. It is the most direct factor influencing people behavior for land using. Cultivated land is the substratum of landscape class in Plain, while in Mountain area is forestland. Patches of different landscape classes are inlaid the substratum. Comparing with mountain area, there are fewer land use types and inconspicuous substratum of landscape class in plain because of human intensive disturbance. Meanwhile patches in plain possess higher geometrical similarity and lower landscape fragment than in mountain area.

Keywords: land use spatial pattern, different geomorphology condition, Zigui County, Jiayu County

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No. 549

The algorithm of creating contour lines based on DEM

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ABSTRACT

Contour line is a closed curve that joined by points of the same elevation. This paper puts forward a new algorithm of creating contour line based on DEM, which uses the method of tracking the same elevation point to study the algorithm based on regular grid. This paper will be divided the algorithm of creating contour line into four sub-algorithms, namely: the algorithm of elevation comparison; the algorithm of calculating the same elevation point coordinates; the algorithm of tracking next point of the same elevation, the algorithm of tracking contour line. The algorithm of elevation comparison is mainly used in judging whether a contour line with appointed elevation passes through a side of the grid; the algorithm of calculating the same elevation point coordinates is used to calculate coordinates of contour lines across the grid's side; function of the algorithm of tracking next point of the same elevation is to track next point of the same elevation by following the trend of contour lines; the algorithm of tracking contour line aims in tracking coordinates of the point which has the equal value of elevation with the point in row *x* and column *y*.

Keywords: contour lines creation, regular grid, tracking next point of the same elevation, tracking contour line

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No. 550

Statistical texture for contour interval choice 1:50,000 DEMs based

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ABSTRACT

How to choose contour interval in different geomorphologic type areas is a challenging job. In the paper a statistical texture method is used to measure the distance between Loess Hillock and Loess Ridge in Loess Plateau, which geomorphologic types are hills. The result shows that when the two areas classified into 25 classes or so with the contour interval 15 and 19 individually, the class separability seems more distinct than less than 25 classes. The results also shows that when the number of class is bigger than 25, the class separability decrease instead of increasing correspondingly. It seems that the too many classes used may produce more details in cost of decreasing class separability. And in the seven statistical variables, the number of polygons is the most stable while the mean grayscale, the standard variation of grayscale are the most sensitive when the contour interval changes. The result indicates that the contour interval mainly influences by elevation and relative relief without more information which being dominant. By aid of an appropriate contour interval, the landform features can be easily extracted and is very helpful in delaminate the topography.

Keywords: contour interval, statistical texture, hill, DEMs, grayscale, class separability

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No. 551

Interactive visualization of three dimensional pipelines using Ajax and X3D

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ABSTRACT

The developments of three dimensional pipelines are mainly on the COM component of GIS software, three dimensional visualization library and client-sever software architectures. These methods are still not sufficient in supporting remote management of 3D pipelines, because the client and the server involved in the process may require two-way communication frequently as well as modeling results visualization intuitively. In this paper we proposed a solution to 3D pipeline management system, which provides convenience of operation, exactness of position and rapidness of update for the pipelines in the web context. We realized web-based interactive visualization for 3D pipelines using AJAX and X3D.

Keywords: Web-GIS, Ajax, X3D, three dimensional pipelines.

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No. 552

Modeling Residential Burglary in a Hybrid CA/MAS System with Automatic AHP Calibration

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ABSTRACT

This paper presents an innovative approach to the study of residential burglary. A simulation model is built upon the integration of Cellular Automata (CA) and Multi-Agent Systems (MAS), which utilizes journey-to-crime (JTC), social disorganization (SD), and routine activity (RA) theories to predict locations of residential burglary targets. Offenders are implemented as MAS agents on top of CA automata of targets and places. Each offender has a certain motivation to commit a crime, determined by his/her age, race and gender background. Likewise, each possible location has a particular attractiveness to the offender, such as target desirability and place lack-of-guardianship, which are dependent on neighborhood characteristics, such as median income, race composition, commute time and length of tenure. This model also employs the Analytic Hierarchy Process (AHP) to derive the parameter weights. Unlike traditional AHP where pairwise comparisons are conducted manually and subjectively, this model automatically calibrates the pairwise comparison scoring to derive parameter weights for the model based on empirical data.

Keywords: Residential Burglary, Journey to Crime, Routine Activity Theory, Social Disorganization Theory, Cellular Automata, Multi-Agent Systems, Simulation, Analytic Hierarchy Process

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No. 553

Wetland Resources Investigation based on "3S"technology

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ABSTRACT

Wetland is a special ecosystem between land and water. It can provide massive foods, raw material, water resources and habitat for human being, animals and plants, Wetlands are so important that wetlands' development , management and protection have become the focus of public attention . "3S" integration technology was applied to investigate wetland resources in Shandong Province ,the investigation is based on remote sensing(RS) information, combining wetland-related geographic information system(GIS) data concerning existing geology, hydrology, land, lakes, rivers, oceans and environmental protection , using the Global Positioning System (GPS) to determine location accurately and conveniently , as well as multi-source information to demonstrate each other based on "3S" integration technology. In addition, the remote sensing (RS) interpretation shall be perfected by combining house interpretation with field survey and combining interpretation results with known data.By contrasting various types of wetland resources with the TM, ETM, SPOT image and combining with the various types of information, remote sensing interpretation symbols of various types of wetland resources are established respectively. According to the interpretation symbols, we systematically interpret the wetland resources of Shandong Province. In accordance with the purpose of different work, we interpret the image of 1987, 1996 and 2000. Finally, various interpretation results are processed by computer scanning, Vectored, projection transformation and image mosaic, wetland resources distribution map is worked out and wetland resources database of Shandong Province is established in succession. Through the investigation, wetland resource in Shandong province can be divided into 4 major categories and 17 sub-categories. we have ascertained the range and area of each category as well as their present utilization status.. By investigating and calculating, the total area of wetland in Shandong Province is 1,712,200 hm^2, which accounts for 7.58% of the total area of land in Shandong Province (not including the wetland in the shallow waters along the coast). Among them, area of river wetland is 286,746 hm^2, area of lakes wetland is143,490 hm^2, area of reservoir and pond wetland is 118,693 hm^2, area of offshore and coastal wetland is 994,100 hm^2, and area of other wetland is 169,171 hm^2. On the basis of this, we can analyze the dynamic changes trend and the reasons: steady degenerating for natural wetlands, increasing year by year for artificial wetland, and the distribution pattern takes shape that the existing natural wetlands are being protected and the increase of new artificial wetlands is in conformity with the social development , so the situation of the wetland resources is developing towards a virtuous circle direction.

Keywords: wetland resources investigation, "3S" technology, Remote sensing(RS), Global Positioning System(GPS),Geographic information System(GIS),RS interpretation, ENVI, ArcGIS

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No. 554

Earthquake damage scenario simulation of a water supply system in Taipei

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ABSTRACT

Taiwan is located in the Circum-Pacific Belt and at the junction of the Philippine Sea Plate and the Eurasian Plate. The island is squeezed over a long period of time, so the frequency of the occurrence of earthquakes is very high. Changes of terrain due to seismic forces such as fault ruptures and surface uplifts could cause extensive damage to water pipeline networks. The 921 Ji-Ji earthquake was one of the most serious disasters in recent years in Taiwan, and it indeed resulted in the most severe damage of water supply systems. The urban water supply network is very important for municipal water management in Taiwan. If the water supply systems break down, hospitals and fire stations will not have enough water to carry out the rescue work, and the results may worsen the disasters. This study took the water supply system of the West District in Taipei City as an example. First, the metro-Taipei area was split into three hundred and twenty-seven 1 km by 1 km cells. Second, the location of a simulated earthquake was determined. Third, the Peak Ground Acceleration (PGA) value of each cell was calculated by an empirical formula. Fourth, the Repair Rate (RR) of each cell was calculated based on its PGA value. Fifth, using the GIRAFFE software developed by Cornell University, the Monte Carlo simulation method was used to simulate the possible damage to the water supply system. And finally, the EPANET program developed by the US Environmental Protection Agency was applied to compute the distribution of flow volumes and water pressures of the damaged water supply system. Results of the pipeline network under different scenarios of earthquake magnitudes are shown in this study, and they provide an evaluation basis to decision makers to improve the pipeline infrastructures for fire protection after major earthquakes.

Keywords: GIS, Water Supply System, Earthquake, Taipei

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No. 555

Beijing-1 small satellite multi-spectrum image classification based on neighborhood EM algorithm and its uncertainty assessment

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ABSTRACT

In order to overcome the deficiencies of traditional uncertainty assessment methods of remote sensing images classification by error-matrix and kappa coefficient, classification uncertainties at pixel scale of Beijing-1 small satellite multi-spectrum remote sensing images were measured and represented. Firstly, an unsupervised classification algorithm-neighborhood EM considering spatial autocorrelation and classification fuzziness-was introduced. Then, four uncertainty assessment indexes of neighborhood EM classification-fuzzy membership residual, relative maximum fuzzy membership deviation, fuzzy membership entropy and relative fuzzy membership entropy - were constructed. Finally, the experiments concerned were performed using Beijing-1 small satellite multi-spectrum remote sensing image data in Dongkunlun, Qinghai province, China.

Keywords: Beijing-1 small satellite; neighborhood EM algorithm; uncertainty assessment

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No. 556

A COMPARISON STUDY ON SPOT5 IMAGE FUSION AND QUALITY ASSESSMENT

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State Key Laboratory of Remote Sensing Science, Jointly Sponsored by the Institute of Remote Sensing Applications of Chinese Academy of Sciences and Beijing Normal University, Beijing, China

ABSTRACT

Remote Sensing is the acquisition of information about an object without touching it. Remote sensing data and image analysis are used as major tools in investigating natural formations and man-made structures. Remote sensing techniques have proven to be very useful in the search for archaeological sites. Techniques such as aerial photography, color-infrared photography, thermal infrared multi-spectral scanning, and radar imaging have successfully been used to locate potential archaeological sites and add questions to known sites. Image fusion, defined by Franklin and Blodgett (1933) as the computation of three new values for a pixel based on the known relationship between the input data for the location in the image, has been advocated in a large number of papers as a suitable technique to improve the spatial appraisal of an image produced by merging low spatial resolution data with high spatial resolution data. The different images to be fused can come from different sensors of the same basic type or they may come from different types of sensors. The composite image should contain a more useful description of the scene than provided by any of the individual source images. In our work, the simultaneously acquired SPOT5 multi-spectral images and SPOT5 panchromatic images are collected. First of all, the geometric correction is conducted to all the images with the error less than 0.5 pixels to make sure the high quality of image fusion. Then image fusion in pixel lever is performed and the image fusion quality is assessed by different criteria.

Keywords: image fusion, remote sensing, fusion quality, criteria, SPOT5

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No. 558

The Ground-based Lidar Combined with Sunphotometer for Aerosol Optical Depth Retrieval

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ABSTRACT

Aerosol particles are important components of the earth-atmosphere system, not only affecting atmospheric visibility of the earth's surface from space, but also be an important element to the occurrence of cloud that aerosol particles serve as the primary source of cloud condensation nuclei(CCN). Remote sensing of aerosol properties from space/satellite can reveal the tendency of temporal-spatial distribution in global scale, however, whose precision can't satisfy the request of quantitative remote sensing. Thus, in this paper proposes the method combined sunphotometer (passive measurements) and Lidar (active remote sensing measurements) developed by Wuhan University to retrieve the aerosol optical depth. The primary results show that the proposed method improved the precision of aerosol optical depth effectively. Furthermore, long-term atmospheric and aerosol data could be obtained by consecutive Lidar and sunphotometer observations. Also these data will be used for emending the existing atmospheric model and aerosol type, and make them more compliant for China area application.

Keywords: Lidar, Sunphotometer, Aerosol Optical Depth

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No. 559

Location Effect Analysis of Land Using Change in Coal Mining Subsidence Area Based on RS and GIS

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ABSTRACT

China is one of the large coal mining countries in the world. Coal mining accelerates economic prosperity, as well as engenders a series of environment problems either. One of the most obvious problems is that coal mining changes the landforms around the mining areas. Abundant arable area, garden area, forest area and construction area have been changed under the drive of this dynamic landform. The law that other environment elements change resulting from transformation of one element can be analysed by location theory---Concentric-Circle Mode (or Circle Layer Mode) proposed by professor E. W. Burgess of Chicago University. For the case of Longkou coal mining subsidence area in Shandong province, based on the ground measurement elevation data of the years of 1978, 1989, 1995 and 2004, firstly, this paper considers the DEM data of 1978 before subsidence as standard elevation, and calculates the difference value DEM data of three periods through the difference operation of the other later three-period DEM data and the standard elevation. The coal mining subsidence region and area can be figured out, which is grid region and the overall sum of the grid area with $z<0$. Secondly, by choosing the digital remote sensing images which are the same period with the later three-period DEM data, with operation of the classifier of BP Artificial Nerve Network (BPNN), the author classifies these images by combining spectral information, texture information of remote sensing image with terrain index. Thirdly, under the guidance of location theory, the author uses location index to make "location image". Lastly, with spatial superposition of location image, three-period DEM data and land use classification result, the author figures out the area and proportion of all the land use types in different locations and the transfer matrix of land use types, and analyses the rule of space-time change of land use in different locations, in order to explain the location effect that coal mining subsidence affect land-use change.

Keywords: GIS, remote sensing, coal mining subsidence, land use, location effect

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No. 560

Study on Approaches of Spatial Data Edge Matching in GIS

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ABSTRACT

The paper introduces the edge matching method of vector data on the basis of the arbitrary polygon domain. The method contains three steps: (1) the edge matching features district is divided into source features and target features in terms of the edge matching domain; (2) logical edge matching; (3) the automatic combination of attribute fields while physical edge matching. Test analysis indicated that the method of edge matching extends the mapsheet domain of edge matching to arbitrary polygon domain. The edge buffer search reduces the searched data, which greatly increases the search efficiency, and consequently improves the edge matching efficiency and the accuracy rate. The advantages and the procedure of the programs will be elaborated in the paper.

Keywords: data edge matching; edge matching buffer; source features; target features

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No. 561

Effectiveness of Survey Points' Density and Distribution on Vegetation Coverage Field Measurement

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ABSTRACT

Vegetation coverage is a widely used parameter to measure global and regional environment change. Evaluating the accuracy and efficiency of vegetation coverage using digital photography under various survey points' densities and distribution patterns has an important referential significance for providing an optimized field measurement method. The vegetation field measurement was carried out in a sample with Artemisia ordosica shrubs in Mu Us sandy land using vertical hoisting digital camera, with four densities and nine distribution patterns of survey points. The results showed that: different density of survey points led to a slight accuracy difference, and the precision improves as the density increases. The sample size had great impact on the precision. Different point distribution patterns led to significantly different results. "◇" pattern can get relatively higher degree of accuracy with least points and shortest walking distance in field survey. It's the best choice that could meet the requirements of the maximum precision and minimum workload in the vegetation field measurement.

Keywords: Vegetation coverage, field measurement, survey point density, distribution pattern, accuracy and efficiency

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No. 562

Modeling and predicting urban growth pattern of the Tokyo metropolitan area based on cellular automata

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ABSTRACT

The period of high economic growth in Japan which began in the latter half of the 1950s led to a massive migration of population from rural regions to the Tokyo metropolitan area. This phenomenon brought about rapid urban growth and urban structure changes in this area. Purpose of this study is to establish a constrained CA (Cellular Automata) model with GIS (Geographical Information Systems) to simulate urban growth pattern in the Tokyo metropolitan area towards predicting urban form and landscape for the near future. Urban land-use is classified into multi-categories for interpreting the effect of interaction among land-use categories in the spatial process of urban growth. Driving factors of urban growth pattern, such as land condition, railway network, land-use zoning, random perturbation, and neighborhood interaction and so forth, are explored and integrated into this model. These driving factors are calibrated based on exploratory spatial data analysis (ESDA), spatial statistics, logistic regression, and "trial and error" approach. The simulation is assessed at both macro and micro classification levels in three ways: visual approach; fractal dimension; and spatial metrics. Results indicate that this model provides an effective prototype to simulate and predict urban growth pattern of the Tokyo metropolitan area.

Keywords: CA, GIS, urban model, geosimulation, the Tokyo metropolitan area

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No. 563

A quantitative analysis of urban growth and associated thermal characteristics using Landsat satellite data

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ABSTRACT

Urbanization transforms the natural landscape to anthropogenic urban land use and changes surface physical characteristics. Accurate information on the extent of urban growth and its impacts on environment are of great interest for diverse purposes. As a result, increased research interest is being directed to the mapping and monitoring of urban land use using remote sensing techniques. However, there are many challenges in deriving urban extent and development densities quantitatively. This study utilized remote sensing data of Landsat TM/ETM+ to assess urban sprawl and its thermal characteristics in Changsha of central China. A new approach was proposed for quantitatively determining urban land use extents and development densities. Firstly, impervious surface areas were mapped by integrating spectral index derived from remotely sensed data. Then, the urban land extents and development densities were identified by using moving window calculation and selecting certain threshold values. The urban surface thermal patterns were investigated using Landsat thermal band. Analysis results suggest that urban extent and development density and surface thermal characteristics and patterns can be identified through qualitatively based remotely sensed index and land surface temperature. Results show the built-up area and urban development densities have increased significantly in Changsha city since 1990s. The differences of urban development densities correspond to thermal effects where higher percent imperviousness is usually associated with higher surface temperature. Remotely sensed index and land surface temperature are demonstrated to be very useful sources in quantifying urban land use extent, development intensity, and urban thermal patterns.

Keywords: Urban growth; thermal characteristics; remotely sensed index, Changsha

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No. 565

Land resource change and its protective countermeasures in Tumen River Region, part in China

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ABSTRACT

In this paper, we analyzed the land resource condition, and utilized remote sensing and GIS technique detecting the land use dynamic from 1976 to 2000 in Tumen River Region, which possess remarkable position in the boundary economic development among Russia, China and North Korea. Based on these work we explained the existent problems of land use in this region, and give some counter-measure for land resources sustainable utilization.

Keywords: Land use dynamic, RS and GIS, Remote sensing, Tumen River Region

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No. 568

3D Ground-Water Flow Modeling Based on GIS

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ABSTRACT

The geographical information system (GIS) has provided the effective tools to capture, store, manage, analyze and express the spatial information. Gradually, the research region has included the dynamical mechanism and the spatial-time characteristics of the geography process, transmission mechanisms, uncertainty (multi-solutions), predictability, and so on. Corresponding, GIS modeling is one of hotspots of current GIS research. The paper is the embodiment of GIS modeling methods applied to geo-simulation research. Also it provides the model support for the management of the ground water resources. In this paper, the methods for constructing the ground-water conceptual model through 3D stratum model are discussed. Firstly, the constructing method of delaunay triangulation with constraint conditions is proposed, which is suitable to the ground-water flow simulation. Then stratum (or aquifer) multi-DEMs are completed. Based on the multi-DEMs, the Su-Xi-Chan hydrogeological conceptual model is reconstructed by irregular Tri-prism. In order to prevent dispersed irregular tri-prism voxels from disunity, the spatial index mechanism is established for groundwater model. Finally, the 3D groundwater simulation model is integrated with GIS, which can provide data for 3D numerical simulation. The results indicate that the integration of 3D GIS and geo-analysis model be convenient and can accelerate process simulation of geo-science.

Keywords: 3D stratum model; irregular Tri-prism; spatial discretization; 3D GIS

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No. 569

A New Distributed Computing Model of Mobile Spatial Information Service Grid Based on Mobile Agent

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ABSTRACT

A new distributed computing model of mobile spatial information service is studied based on grid computing environment. Key technologies are presented in the model, including mobile agent (MA) distributed computing , grid computing, spatial data model, location based service (LBS), global positioning system (GPS), code division multiple access (CDMA), transfer control protocol/internet protocol (TCP/IP), and user datagram protocol (UDP). In order to deal with the narrow bandwidth and instability of the wireless internet, distributed organization of tremendous spatial data, limited processing speed and low memory of mobile devices, a new mobile agent based mobile spatial information service grid (MSISG) architecture is further proposed that has good load balance, high processing efficiency, less network communication and thus suitable for mobile distributed computing environment. It can provide applications of spatial information distributed computing and mobile service. The theories and technologies architecture of MSISG are built originally from the base, including spatial information mobile agent model, distributed grid geographic information system (GIS) server model, mobile agent server model and mobile GIS client model. An application system for MSISG is therefore developed authorship by visual c++ and embedded visual c++. A field test is carried out through this system in Shanghai, and the results show that the proposed model and methods are feasible and adaptable for mobile spatial information service.

Keywords: distributed computing, grid computing, mobile spatial information service grid, mobile agent, wireless communication

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No. 570

Research and Development of Visualization-Analysis Oriented Digital Map Data Model

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ABSTRACT

What we are now facing is the dilemma when we try to integrate Digital Cartographic Model (DCM), which is symbol-oriented model, and Digital Landscape Model (DLM), which is the geographical entity and topology oriented model. Basic theory of map modeling method of geographical data is researched. A new type of digital map data model is raised out and designed, including four levels as conceptual, logical, and physical model to satisfy visualization and spatial analysis at the same time. The formation of the digital map logic model relies on abstracting and summarizing the world by means of the object-oriented method, putting forward the conceptual model of the object-oriented digital map according to the OGC abstract norm, dwelling on all the kinds of objects in the model and logical design in which spatial data, attribute data, symbols, and topology are all stored in relational database, in form of various but inter-linked relational tabulations as point, line, area, label, symbol, etc. And meanwhile, the author develops the data-modeling tool which turns the storage of the digital map in the relational database management system into realities, thus realizes digital map storage and manages in Microsoft SQL Server.

Keywords: Digital map, Object-oriented data model, conceptual data model, Logic data model, physics Data model, relational database

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No. 572-1

The atmospheric correction algorithm for HY-1B/COCTS

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ABSTRACT

China has launched her second ocean color satellite HY-1B on 11 Apr., 2007, which carried two remote sensors. The Chinese Ocean Color and Temperature Scanner (COCTS) is the main sensor on HY-1B, and it has not only eight visible and near-infrared wavelength bands similar to the SeaWiFS, but also two more thermal infrared bands to measure the sea surface temperature. Therefore, COCTS has broad application potentiality, such as fishery resource protection and development, coastal monitoring and management and marine pollution monitoring. Atmospheric correction is the key of the quantitative ocean color remote sensing. In this paper, the operational atmospheric correction algorithm of HY-1B/COCTS has been developed. Firstly, based on the vector radiative transfer numerical model of coupled ocean-atmosphere system- PCOART, the exact Rayleigh scattering look-up table (LUT), aerosol scattering LUT and atmosphere diffuse transmission LUT for HY-1B/COCTS have been generated. Secondly, using the generated LUTs, the exactly operational atmospheric correction algorithm for HY-1B/COCTS has been developed. The algorithm has been validated using the simulated spectral data generated by PCOART, and the result shows the error of the water-leaving reflectance retrieved by this algorithm is less than 0.0005, which meets the requirement of the exactly atmospheric correction of ocean color remote sensing. Finally, the algorithm has been applied to the HY-1B/COCTS remote sensing data, and the retrieved water-leaving radiances are consist with the Aqua/MODIS results, and the corresponding ocean color remote sensing products have been generated including the chlorophyll concentration and total suspended particle matter concentration.

Keywords: Atmospheric correction, ocean color remote sensing, HY-1B, COCTS

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No. 572-2

The quasi-analytic remote sensing algorithm of CDOM in the China Yellow Sea and East Sea

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ABSTRACT

Colored dissolved organic matter (CDOM) is one of the most important optical components which affect the sea surface spectral. Because of the similar spectral absorption properties between CDOM and organic detritus, it is difficult to separate them, especially in the coastal water with high turbidity. In many study, the total absorption coefficient of CDOM and organic detritus was combined as a optical parameter retrieved by the remote sensing algorithms. In this paper, a quasi-analytic remote sensing algorithm of CDOM has been developed, which can separate the absorption between CDOM and organic detritus. Firstly, the absorption spectrums of CDOM and organic detritus have been analyzed using the in-situ optical dataset measured by the Case II water optical investigation program in China Yellow Sea and East Sea in the spring, 2003. And then, a quasi-analytic remote sensing algorithm of CDOM has been developed to derive the absorption coefficients of the CDOM and organic detritus separately from the total absorption coefficient which can be retrieved from ocean color remote sensing data directly. The algorithm has been validated using the in-situ optical dataset of China Yellow Sea and East China Sea in the spring of 2003, and the synthesis optical data set and global in situ data set from IOCCG, and the results show that this algorithm perform well.

Keywords: CDOM, quasi-analytic algorithm, ocean color remote sensing

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No. 574

Study on Decision Making of Ecological Environment Protection and Sustainable Development Based on Measurement and Assessment

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ABSTRACT

The key problem for implementation of the sustainable development is to design the strategy and policy which incorporates the environmental impacts. This paper puts forward a new model about decision making of ecological environment protection and sustainable development based on estimating and assessment. The environmental carrying capacity and developing intensity of studied area are analyzed, the ecological security and the level of sustainable development are evaluated, and also the constraints are discussed. According to this analysis, the range of Lichuan is divided into four regions. On the foundation of distinctive characteristics of each area, the designation of the industrial development and environment protection have been ensured; after that, the environmental impact of the given strategies has been identified and predicted; finally, several mitigation measures are suggested.

Keywords: Decision making, ecological environment protection, sustainable development measurement, assessment

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No. 575

Simultaneous Correction of GPS Error and Map Error for Improved Map-matching: Algorithm and Application

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ABSTRACT

This paper presents an improved map-matching algorithm for GPS-based vehicle navigation systems. The proposed approach attempts to correct the GPS error and the Map error simultaneously through a unique combined Kalman filter and virtual differential error correction approach. An advanced Kalman filter algorithm was developed, which, in conjunction with the virtual differential algorithm, handles the biased error and the random error of GPS as well as the map error. Both the along-track and cross-track errors are considered in the error correction process. The performance of the algorithm is thoroughly examined by sample applications and the results are reasonably well.

Keywords: map-matching, Kalman filter, virtual differential method, GPS, vehicle navigation system

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No. 576

Modeling the Dynamics of Urban Growth Using Multinomial Logistic Regression: A Case Study of Jiayu County, Hubei Province, China

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ABSTRACT

Urban growth modeling, one of the most important aspects of land use and land cover change study, has attracted substantial attention because it helps to comprehend the mechanisms of land use change thus helps relevant policies made. This study applied multinomial logistic regression to model urban growth in the Jiayu county of Hubei province, China to discover the relationship between urban growth and the driving forces of which biophysical and social-economic factors are selected as independent variables. This type of regression is similar to binary logistic regression, but it is more general because the dependent variable is not restricted to two categories, as those previous studies did. The multinomial one can simulate the process of multiple land use competition between urban land, bare land, cultivated land and orchard land. Taking the land use type of Urban as reference category, parameters could be estimated with odds ratio. A probability map is generated from the model to predict where urban growth will occur as a result of the computation.

Keywords: GIS, modeling, urban growth, multinomial logistic regression, land use competition

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No. 577

Time-space and cognition-space transformations for transportation network analysis based on multidimensional scaling and self-organizing map

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ABSTRACT

Geographic space, time space and cognition space are three fundamental and interrelated spaces in geographic information systems for transportation. However, the cognition space and its relationships to the time space and geographic space are often neglected. This paper studies the relationships of these three spaces in urban transportation system from a new perspective and proposes a novel MDS-SOM transformation method which takes the advantages of the techniques of multidimensional scaling (MDS) and self-organizing map (SOM). The MDS-SOM transformation framework includes three kinds of mapping: the geographic-time transformation, the cognition-time transformation and the time-cognition transformation. The transformations in our research provide a better understanding of the interactions of these three spaces and beneficial knowledge is discovered to help the transportation analysis and decision supports.

Keywords: GIS-T, time-space, cognition-space, transportation, multidimensional scaling, self-organizing map, spatiotemporal

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No. 578

Study on GIS-based Flood Risk Map for flood detention area

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ABSTRACT

Flood Risk Map is one of the important non-engineering measures for flood control and disaster reduction. On the basis of the flood risk analysis, and with the powerful spatial analysis and display functions of Arc GIS, the Flood Risk Map in flood detention area can be drawn automatically through the redevelopment of Arc GIS by Arc Engine. Firstly, a new layer can be created according to the boundary of the flood detention area. When simulating the inundate characteristics of specific flood regimes, the boundary of the flood detention area and the main water barriers within the flood detention area are used as the constraint boundaries. The computed grids layer can be created automatically for the 2-D hydraulic model. Meanwhile, after setting the time step in the flood simulation, some important hydrological elements such as water stage, velocity and flow direction can be computed for every grids at each time step; secondly, a series of fields which are corresponding to the hydrological elements can be created in the attribution table of the calculated grid layer, and importing the result of the flood simulation into the same attribution table, then, according to the values of the hydrological elements and the need of the visual effect, the fields in every calculation grids are colored automatically in classified levels by the corresponding color matching scenarios, thus obtaining the flood risk layer; finally, based on the classified results of the colored fields, do some operations such as merging and smoothing to the flood risk layer, and adding some other basic layers then forming a complete Flood Risk Map. As an example, the method was applied to mapping the Flood Risk Map for Mengwa flood detention area which is located on the left side of Huaihe River in Anhui province. It indicated that the procedure presented in this paper provides an alternative to draw the comprehensive Flood Risk Map by a quick and efficient way.

Keywords: GIS, Flood risk map, Non-engineering measures, hydraulic model, Mengwa flood detention area

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No. 579

Development of InSAR Technology on Deformation Monitoring

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ABSTRACT

In recent years, application of InSAR (Interferometric Synthetic Aperture, Radar) to deformation monitoring has become a hotspot in research of geological hazards. This paper introduces the basic principles and data processing procedures of InSAR and summarizes main progresses made in InSAR technology and its application to deformation monitoring. Through actual examples of application and research at home and abroad, the article figures out existing problems and the future of application of InSAR.

Keyword: InSAR, Deformation Monitoring, Hazards

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No. 580

Intelligence Based Automatic Detection and Classification of Ground Collapses Using Object-Based Image Analysis Method: A Case Study in Paitan of Pearl River delta

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ABSTRACT

In this paper, a new method is proposed by applying case-based reasoning technique for detecting the ground collapses. The study demonstrates that the high resolution remote sensing images are suitable for monitoring the ground collapses in the study area with karst relief. With the help of object-based image analysis method, the generic algorithm (GA) for optimizing the spatial, shape, spectral, hierarchy and textural features was used in the multi-scale image segmentation with the good fitness value, and then the case library was built for detecting the collapse. The case library is reusable for place-independent detection. The proposed method has been tested in the Pearl River Delta in south China. The result of ground-collapse detection is well.

Keywords: ground collapse, CBR, case library, object-based classifications, Genetic algorithms

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No. 581

Regional evapotranspiration estimation using SEBAL model with remotely sensed data in Guanzhong Plain and Weibei Tablelands

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ABSTRACT

To some extent, the estimations of regional evapotranspiration using remotely sensed data could help researchers and decision makers to analyze regional crop water stress information, to estimate drought extent and water supply situation, and to make decisions on crop water management, especially for irrigation farming systems. In this paper, the Surface Energy Balance Algorithm for Land (SEBAL) is applied to retrieve land surface evapotranspiration in Guanzhong Plain and Weibei Tablelands by using Landsat TM data. After the preprocessing of the remotely sensed data and weather observation data, some algorithms of inversing the parameters under the SEBAL are developed locally. By using energy balance equation, latent heat flux during satellite overpass and the integrated daily fluxes in Guanzhong Plain and Weibei Tablelands are estimated. On the basis of the study area, some locally retrieved land surface parameters are used as inputs for the SEBAL. Spatial distributions of surface albedo, land surface temperature, as well as various energy fluxes are drawn. After parameter improvement, statistical analysis indicates that the operating results in Guanzhong Plain and Weibei Tablelands are simple and reasonable, also shows good application prospect of SEBAL.

Keywords: SEBAL, evapotranspiration, estimation, TM

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No. 583-1

Land use change detection based on remote sensing classification and pixel comparison--a case study

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ABSTRACT

In this paper, land use changes were studied based on remote sensing classification and comparison of overlapping pixels methods in Jiading district of Shanghai from 1989 to 2006. Multi-source data including four epochs of representative TM images (in years of 1989, 1995, 2001 and 2006) and the vector topographic map were used in our study. Land use classes were first extracted by remote sensing classification after the image preprocessing such as geometric correction and registration, and a change detection method by comparing the pixels in overlapping images was then presented. Based on the classification results of land use classes with four epochs of TM images, the changes of land uses in three time intervals that 1989-1995, 1995-2001 and 2001-2006 were therefore detected by the detection method, and the conversion process of land uses classes for nearly 20 years was further analyzed in the study area. The conclusion was finally made that the continuous construction of building, road and greenbelt in Jiading district in past decades costs the expenses on a lot of cropland, forest and orchard land.

Keywords: Remote sensing classification, Change detection, Pixel comparison, Land use

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No. 583-2

Rational Function Model Based Geo-positioning Accuracy Evaluation and Improvement of QuickBird Imagery of Shanghai, China

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ABSTRACT

Rational Function Model (RFM) is introduced and RFM-based ground positioning algorithm is derived. Experiments of geo-positioning are conducted based on the Rational Polynomial Coefficients (RPCs) provided in the image support data using QuickBird separate-orbit stereo imagery pair in Shanghai district, China. Positioning errors are then analyzed. According to the error varying characteristics, several compensation models are introduced and used to refine the positioning accuracy. The experimental results show that with only one control point (CP), the positioning accuracy can be largely improved from 23m to 3m using Offset Model. The Offset plus X-scale Model with 2 well distributed CPs can improve the accuracy further to sub meter in planimetry and 1-2m in elevation. Overall, the Affine Model works best for the experimental area. The accuracy turns to be steady and closes towards 0.6m in planimetry and 1m in elevation when more than 4 well distributed control points are available using Affine Model either in image space or in object space.

Keywords: Rational Function Model, Rational Polynomial Coefficient, QuickBird, Stereo positioning, Accuracy

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No. 583-3

Spatial-temporal data model and fractal analysis of transportation network in GIS environment

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ABSTRACT

How to organize transportation data characterized by multi-time, multi-scale, multi-resolution and multi-source is one of the fundamental problems of GIS-T development. A spatial-temporal data model for GIS-T is proposed based on Spatial-temporal-Object Model. Transportation network data is systemically managed using dynamic segmentation technologies. And then a spatial-temporal database is built to integrally store geographical data of multi-time for transportation. Based on the spatial-temporal database, functions of spatial analysis of GIS-T are substantively extended. Fractal module is developed to improve the analyzing in intensity, density, structure and connectivity of transportation network based on the validation and evaluation of topologic relation. Integrated fractal with GIS-T strengthens the functions of spatial analysis and enriches the approaches of data mining and knowledge discovery of transportation network. Finally, the feasibility of the model and methods are tested thorough Guangdong Geographical Information Platform for Highway Project.

Keywords: Transportation Network; GIS; Spatial-temporal data model; Fractal

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No. 584

Incorporating Spectral, Texture and Shape Information for High Spatial Resolution Satellite Imagery Classification

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ABSTRACT

Texture and shape analysis offer interesting possibilities to characterize the structural heterogeneity of classes in the high spatial resolution satellite imagery. In this paper, texture features are generated based on the Gaussian Markov random field (GMRF) model, and shape features are measured using geometric moments. Then feature selection is implemented according to the class separability. To reduce the border blurring effect introduced by texture features, the unsupervised classification algorithm involved ordered procedures is proposed, in which linear objects are extracted using spectral and shape features firstly, then other objects are detected using the combination of spectral, texture, and shape features. The proposed classification method is implemented using QuickBird imagery. For comparison, the standard K-means method with spectral data is used as a benchmark. The experimental results show that the ordered classification method with the combination of spectral, texture, and shape information performed better than conventional methods.

Keywords: Texture feature, shape feature, high spatial resolution, classification

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No. 585

An object-oriented spatial data model for virtual geographical environment

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ABSTRACT

This paper presents a spatial data model used for modeling geospatial data in virtual geographical environment. Most traditional spatial data modeling approach in geographical information system abstracts physical world with spatial entity and relationship between each other, put emphases on representing spatial feature and their topologies, whilst virtual reality system focus on capacity of keeping vivid rendering, i.e. high fidelity. Taking into account both topological characteristic of spatial data model in GIS and spaghetti characteristic of in VR, We introduce here an integrated spatial data model which could represent both topological and non-topological spatial data and underpin both various spatial analysis functions and real-time rending visualization effectively. This object-oriented method model topological feature separately from geometrical data and links them by a couple link, by which user can access different aspect of spatial data in specific application context. A virtual geographical scene management framework based on above spatial data model is introduced at the last.

Keywords: VGE, spatial data model, topological model, geometrical model

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No. 586

VRLane: a Desktop Virtual Safety Management Program for Underground Coal Mine

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ABSTRACT

VR technologies, which generate immersive, interactive, and three-dimensional (3D) environments, are seldom applied to coal mine safety work management. In this paper, a new method that combined the VR technologies with underground mine safety management system was explored. A desktop virtual safety management program for underground coal mine, called VRLane, was developed. The paper mainly concerned about the current research advance in VR, system design, key techniques and system application. Two important techniques were introduced in the paper. Firstly, an algorithm was designed and implemented, with which the 3D laneway models and equipment models can be built on the basis of the latest mine 2D drawings automatically, whereas common VR programs established 3D environment by using 3DS Max or the other 3D modeling software packages with which laneway models were built manually and laboriously. Secondly, VRLane realized system integration with underground industrial automation. VRLane not only described a realistic 3D laneway environment, but also described the status of the coal mining, with functions of displaying the run states and related parameters of equipment, per-alarming the abnormal mining events, and animating mine cars, mine workers, or long-wall shearers. The system, with advantages of cheap, dynamic, easy to maintenance, provided a useful tool for safety production management in coal mine.

Keywords: virtual reality, 3D reconstruction, safety management, underground laneway

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No. 587

Research on Monocentric model of Urbanization by Agent-based Simulation

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ABSTRACT

Over the past years, GIS have been widely used for modeling urbanization from a variety of perspectives such as digital terrain representation and overlay analysis using cell-based data platform. Similarly, simulation of urban dynamics has been achieved with the use of Cellular Automata. In contrast to these approaches, agent-based simulation provides a much more powerful set of tools. This allows researchers to set up a counterpart for real environmental and urban systems in computer for experimentation and scenario analysis. This Paper basically reviews the research on the economic mechanism of urbanization and an agent-based monocentric model is setup for further understanding the urbanization process and mechanism in China. We build an endogenous growth model with dynamic interactions between spatial agglomeration and urban development by using agent-based simulation. It simulates the migration decisions of two main types of agents, namely rural and urban households between rural and urban area. The model contains multiple economic interactions that are crucial in understanding urbanization and industrial process in China. These adaptive agents can adjust their supply and demand according to the market situation by a learning algorithm. The simulation result shows this agent-based urban model is able to perform the regeneration and to produce likely-to-occur projections of reality.

Keywords: urbanization, monocentric model, agent-based simulation, China

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No. 588

Data Management Based On Geocoding Index and Adaptive Visualization for Airborne LiDAR

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ABSTRACT

With more surveying practice and deeper application, data post-process for airborne LiDAR system has been extracted lots of attention in data accuracy, post-process, fusion, modeling, automation and visualization. However, post-process and flexible visualization were found to be the bottle-neck which limits the LiDAR data usage for industrial applications. The cause of above bottle-neck problems is great capacity for LiDAR system. Thus in article a geocoding index based multivariate data management and adaptive visualization will be studied for based on the feature of airborne LiDAR's data to improve automatization of post-process and surveying efficiency.

Keywords: Laser scanning (LiDAR), Data management, Aerial Survey, Visualization, Processing

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No. 589

Automated Knowledge Extraction Based on Scientific Workflow for Satellite Remote Sensing Data

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ABSTRACT

This paper proposed a scientific work flow system framework to realize information automatically extracted for satellite remote sensing data. The article first discusses the importance of automatic extraction of knowledge for remote sensing data; second, introduces definition, development, and types of scientific work flow technology, and adopt WebService-based technology to building scientific work flow; then, describes the implementation of spatio-temporal work flow management system(STWFMS); finally, two application system of remote sensing data were introduced to demonstrate automated knowledge extraction based on scientific workflow.

Keywords: Automated knowledge extraction, Scientific work flow, Remote sensing data

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No. 590

FT-NIR Spectroscopy technique based analysis and Prediction on soil nutrient content of Lychee orchard--A case study in Zhongluotan of Guangzhou, South China

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ABSTRACT

Precision farming with Geoinformatics is a new paradigm for agricultural production, especially in a developing country as China. Precision agriculture is an integrated application referring to the advanced 3S (remote sensing, GIS and GPS) technology and spectroscopy, and the key of this technology is to obtain the spatial and temporal information of the environmental factors such as soil nutrients, which has an influence on the growth of the Lychee crop and agricultural environment protection, and then the appropriate measurement in standard prescription can be adopted to realize "prescription farming" with efficiency for agricultural resource saving and environment protecting. Considering the actual problems and deficiencies of the present technology in the quick information extraction of Lychee soil nutrient, we systematically analyzed the relationships between the intelligent soil Fourier NIR spectrum information and Lychee orchard soil nutrient components such as nitrate (N), total phosphorus (P), potassium (K), organic matter (OM), calcium (Ca), and magnesium (Mg). The content of these components in the 15 in-situ soil samples of Zhongluotan, Guangzhou South China was analyzed against near infrared spectroscopy. The NIR spectral data of soil was treated by partial least square (PLS) analysis, and then the best dimension of analysis was obtained with multivariate linear regression. Upon this, the calibration model was established. The content of some components in Lychee orchard soil was predicted using the calibration model. It is shown that the result of Fourier NIR spectroscopy method was highly related with those of chemical analysis method. The regression coefficients between measured and predicted values of N, OM and pH were 0.93, 0.92, and 0.93, respectively. The correlation coefficient between measured and predicted P, K, Ca, and Mg were satisfactorily acceptable at 0.65, 0.74, 0.61 and 0.69, respectively. It showed that the Fourier NIR spectroscopy method is a good tool for soil nutrient prediction of Lychee garden, especially for soil N, OM and pH. The accuracy of the FT-NIR based PLS models for predict soil nutrient concentration was adequate to be used as a quick evaluation of nutrient composition of Lychee orchard soil for the precision agriculture application.

Keywords: Soil, nutrient content, Lychee orchard, FT-NIR Spectroscopy, partial least square (PLS), prediction, South China

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No. 591

Projecting the land use changes in China for the next two decades using a dynamic simulation framework

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ABSTRACT

The purpose of this paper is to illustrate a modelling framework to simulate large-scale land use changes, and its effect on the structural and functional diversity of the ecosystem and social-economy based on the remotely sensed digital images. The improved DLS model is developed with three scenarios in China from 2001 to 2020. The projection results show that obvious land use changes will take place in the forestry area, grassland, cultivated land and unused land. Dramatic changes will appear in Cultivated area in Northeast China, Huang-Huai-Hai plain and Southwest China. The changes of forestry area are characterized by regional diversification. Grassland decreases mainly along the Great Wall of Inner Mongolia and on Tibets Plateau. The newly expanded urban land, comparably smaller, distributes mainly around the old towns or residential centers. There is no obvious change in water area. The unused area shrinks with the expansion of forest and grass area in Western China. Based on this study, the capability of improved DLS modelling framework in projecting the LUCC scenarios was tested successfully, and a conclusion was made that DLS model is an useful model in scenario construction.

Keywords: land use, projection, dynamic simulation, scenario analysis, improved DLS, China

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No. 593

Analysis on the spatial-temporal change characteristics of flood and drought disasters in China during 1950-2005

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ABSTRACT

The paper is intended to analyze the temporal change and spatial distribution of flood and drought disasters during the period from 1950 to 2005 in China based on the GIS (Geographic Information System) spatial analysis methods. The data for the analysis includes statistical data of the flood and drought disasters which are suffering area and affected area and spatial geographical data of China which are 1:1000 000 province boundary vector map. The spatial data obtained from National Natural atlas published by Institute of Geographical sciences and Nature resources research, CAS. The flood disaster data are gathered from China Hazard Report in 1949-1995 and China Statistical Yearbook compiled by National Bureau of Statistics of China. By analysis of the temporal change and spatial distribution of flood and drought disasters, it can be seen that Flood and drought disasters increased in the research period. Before the middle of 1980s flood and drought disasters had lower and influenced area increased evidently after the middle of 1980s.The indicated that China flood and drought were expanded on the whole situation and stabilizing, this demonstrates China floods and droughts continued on the trend of expansion. China's major flood occurred in the South, the North and floods occurred in both the frequency or intensity was much smaller than the South, China's major drought occurred in the north. The affected rate and suffered rate for flood and drought disasters are positive correlative. This indicates the resistance capacity of agriculture system in China is faintish in general.

Keywords: flood, drought, spatial-temporal change, China

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No. 594

The Research on Data Organization Technology in the Highway Geographic Information System

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ABSTRACT

Data are the basis of GIS. It has direct impact on the efficiency and function of a Highway Geographic Information System (HGIS), because of the characteristics of data model and data organization of the traffic geographic information system such as spatial property, multi-path network, linearity. This paper discussed the data property of HGIS, studied and presented the HGIS spatial data on multi-source and model. Also, it described and verified highway geographical feature of special subject data's linearity, dynamic and multiple-path network property in HGIS.

Keywords: HGIS, data management, multi-source data, linearity reference system, highway dynamic segments

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No. 595

A web-based spatial decision support system for spatial planning and governance in Guangdong Province

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ABSTRACT

After three decades' rapid economic development, Guangdong province faces to thorny problems related to pollution, resource shortage and environmental deterioration. What is worse, the future accelerated development, urbanization and industrialization also comes at the cost of regional imbalance with economic gaps growing and the quality of life in different regions degrading. Development and Reform Commission of Guangdong Province (GDDRC) started a spatial planning project under the national frame in 2007. The prospective project is expected to enhance the equality of different regions and balance the economic development with environmental protection and improved sustainability. This manuscript presents the results of scientific research aiming to develop a Spatial Decision Support System (SDSS) for this spatial planning project. The system composes four modules include the User interface module (UIM), Spatial Analyze module (SAM), Database management module (DMM) and Help module (HM) base on ArcInfo, JSP/Servlet, JavaScript, MapServer, Visual C++ and Visual Basic technologies. The web-based SDSS provides a user-friendly tool for local decision makers, regional planners and other stakeholders in understanding and visualizing the different territorial dimensions of economic development against sustainable environmental and exhausted resources, and in defining, comparing and prioritizing specific territorially-based actions in order to prevent non-sustainable development and implement relevant politics.

Keywords: spatial planning, spatial decision support system, Guangdong

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No. 596

A study on the interaction and evolution of the spatial expansion and administrative division adjustment in Beijing metropolitan area

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ABSTRACT

Since 1990s and especially since 2000, the city space of Beijing has grown rapidly. There's no doubt that the urban construction land area is expanding to the suburban areas, which is the result of rapid social and economic growth in the city and also closely related to the reform of "turning county into district". In other words, the adjustment of administrative division in Beijing interacts with the expansion of urban construction land space. Beijing turns counties into districts and introduces regional offices are two distinct evidence. As for the interaction, there're both advantages and disadvantages and the focus of the article is to explore how to exploit the favorable conditions and avoid unfavorable ones. The article takes the town administrative region as the minimum space unit so as to better explore the anisotropism and regional differences of city space expansion as well as the impact caused by the adjustment of administrative divisions. With initial analysis, we find that: firstly, on the contrary to the sharp reduction of farming land, the city construction land are for residential communities, factories and mines increases the fastest; secondly, the big central cluster expansion has great regional difference and the three directions of northwest, north and south grows the fastest, which is mainly caused by the positive guidance of trunk roads including highway construction; thirdly, the land area in central cluster used for new construction projects is mainly located in suburban area, but exurb districts of Daxing and Changping also take up a considerable proportion; fourthly, as for the key exurb towns including Changping, Shunyi, and Fangshan, the built-up area also grows rapidly.

Keywords: Administrative divisions, urban spatial expansion, spatial relativity and coupling mechanism, Beijing metropolitan area

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No. 597

The Research of Selection Model Based on LOD in Multi-Scale Display of Electronic Map

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ABSTRACT

This paper proposes a selection model based on LOD to aid the display of electronic map. The ratio of display scale to map scale is regarded as a LOD operator. The categorization rule, classification rule, elementary rule and spatial geometry character rule of LOD operator setting are also concluded.

Keywords: Electronic map, Level of detail (LOD), Multi-scale display, Selection, Operator, Spatial geometry character

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No. 598

Landscape change based on RS and GIS in the Jinghe Basin, China

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ABSTRACT

Based on digital Landsat Thematic Mapper (TM/ETM$^+$) (1986, 1995, and 2000) imagery interpretation, landscape changes were analyzed in the Jinghe basin, one of the soil erosion regions in China, to provide basic data for local decision-making as well as sustainable landscape use and management. Results showed that landscape from 1986 to 2000 changed at the basin scale as the area of grassland, shrubland, sparse forestland, and water area decreased, while cropland, built-up land, unused land, other forestland, and forestland increased. Landscape changes mainly occurred in cropland, grassland, built-up land, shrubland, and sparse forestland. Moreover, the changes and area in cropland and grassland were the largest, influencing the whole characteristics of the changes in the Jinghe basin. Analysis of the changes between 1986 and 2000 in the study area indicated that bidirectional change between 1995 and 2000 was more obvious than between 1986 and 1995. But landscape use extent between 1986 and 1995 was bigger than between 1995 and 2000. Landscape developed continuously and transformed obviously before 1995, and which were in the regulation stage after 1995. Based on comparing characteristics between big and small remote sensing satellites, we thought that small satellite could be applied in landscape ecology and land use etc for its merit. We were in preparation for using and validating data from a small satellite in studying landscape changes and comparing the results with some results from a small satellite data.

Keywords: Landscape change, Jinghe basin, loess plateau, GIS

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No. 599

The study of land spacial data celerity transmission on-line

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ABSTRUCT

According to land spacial data sharing demands, study the relation for special data transmission velocity on-line and data quantity by experiments in this contribution. It has educed some valuable conclusions through analysed the result of experimentation of the on-line land spacial data piecemeal transmission experiment. ①When transmission's block data size of the land spacial data is in the 1MB scope, the each time transmission's speed time is the shortest when the block data size is 8KB.Certainly,the transmission's speed time is Not too discrepancy when each time the transmission's block data size is between 4KB and 32KB. ②When transmits the land spacial data size between 1MB and 200MB, the block data size which waste the least transmission time is 32KB. ③ When transmits the land spacial data size around 350MB, the block data size which waste the least transmission time is 512KB.

Keywords: land; spaical data; transmission; spacial data sharing

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No. 600

A quantitative analysis of the grassland landscape pattern in arid oasis —A case study in the Qira

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ABSTRACT

At present the remote sensing technology has become one of the most essential tools in the landscape ecology research. This paper is based on RS images from Landsat TM (1990), ETM (1999) and Aster (2004) imagery, with the support of RS and GIS technology and utilization of landscape ecology principle. Selected suitable image processing system, classification approaches and techniques and made a quantitative analysis of the study area's grassland landscape pattern change. RS image processing software (PCI) and landscape pattern analyzing software (Fragstats) is used in this article. The result shows that: in 1990, 1999 and 2004 the land use landscape pattern in study area experienced the considerable change. As far as the dynamic change of grassland landscape in the study area is concerned, natural factor takes certain driving action but human activities are the main driving force.

Keywords: RS data, land use, grassland, landscape index, Qira County in Xingjiang

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No. 602

The Foundational Theory and Conceptual Model of Cooperative Generalization of Multi-elemental Geographic Information

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ABSTRACT

Geographic information generalization is a necessary means for scale transform of geometric and attributive information of the geographic spatial object sets under the GIS environment. This transformation relates to the complicated spatial and attributive relations within one geographic object, among different objects or elements rather than an isolated or single-elemental object. Thus, one of the ways to solve the conflicts among objects in the generalization is to adopt the strategy which is called he multi-elemental cooperative generalization (MECG), viz. to take the objects of different geographic elements into account. This paper mainly emphasizes the constrained relations (including spatial relation and structural relation) among different elements in generalization process. In this paper, a "from-above-to-below" concept model of multi-elemental cooperative generalization for some geographic elements is also discussed.

Keywords: geographic information, multi-element, cooperative generalization, concept model

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No. 604

Spatial patterns of seaweed distribution in Malaysia using GIS

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ABSTRACT

The objective of this article is to represent spatial patterns of seaweed distribution in Malaysia. Seaweeds have been collected since 1984 along coastlines of 4675 km of peninsular Malaysia, Sabah, and Sarawak. However, there is no seaweed database and they cannot be displayed in a geographic view. Therefore, a database with 805 georeferenced observations was setup and GIS is used to analyze seaweed diversity based on this database. The highest number of observations is 94 which occur along east coastline of peninsular Malaysia. The highest number of species richness is 82 which are also along east coastline of peninsular Malaysia. Rhodophyta has the highest species richness while Chlorophyta has the least species richness.

Keywords: Seaweed, Geographic distribution, GIS, Species richness

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No. 605

Urban Expansion Analysis based on multi-temporal Remote Sensing and GIS in Wujiang, a typical Desakota in Sunan, China (1978-2004)

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ABSTRACT

Rapid economic development during the last three decades has caused a large urban expansion in China, especially in the eastern and coastal areas of China. In these areas, a special urban expansion mode, Desakota (Semi-urbanization), is very popular. Wujiang, a typical Desakota are in Sunan, is chose as the research area to study the special urban expansion based on multi-temporal Remote Sensing and GIS.In this study, maximum likelihood supervised classification and post-classification change detection techniques were applied to Landsat MSS/TM images acquired in 1978, 1986, 1993, 2000, and 2004, respectively, to map land cover changes in the Wujiang, China. A supervised classification was carried out on the five images individually with the aid of ground truth data. Ground truth information collected during two field trips conducted between 2005, 2007 and land use map of 1997, 2004 were used to assess the accuracy of the classification results. Using ancillary data, visual interpretation and expert knowledge of the area through GIS further refined the classification results. Post-classification change detection technique was used to produce change image through cross-tabulation calculation. Changes among different land cover classes were assessed. During the study period, a very severe land cover change has taken place as a result of industrial and urban development projects. These changes in land cover led to cropland degradation in the study area.Result indicates the environmental impacts of urban sprawl of Wujiang. The research suggests that human activities, such as urbanization and industrialization, were playing a much more significant role in the change of land cover and landscape pattern during the last 30 years from 1978.

Keywords: Desakota; Land Use/Cover Change (LUCC); Urban Expansion; Remote Sensing;

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No. 606

Simulation and Prediction of Engineering Deformation through Comparisons of Time Serial and Wavelet Decomposition

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ABSTRACT

Deformation on earth's surface covers crust displacement due to tectonism and land slide or subsidence caused by human activities or natural evolvement. The former is explained by tectonician through geologic investigation and researches. The local creep deformation arisen from engineering activities on earth's surface is complex and is often related with local engineering safety. So this kind of deformation attracts wide attention of many scholars and engineers, and is therefore discussed in this paper in way of simulation and prediction. In our work, we compared Auto Regressive (AR), Moving Average (MA) and ARMA models and used AR model to replace other time serial models based on their equivalence. It is found that AR or ARMA are fit for modeling or prediction, but it is hard to obtain deformation mechanism. Wavelet transform (WT) has shown great potential in information extraction and identification. It is also used as a tool to deal with deformation extraction and analysis in this paper. Tests have shown that it can be applied to distinguish different components from mixed observation serials. It is known that an observed serial in deformation monitoring is composed of sophisticated components and each represents different contents and is attributed to some acting factors. In this research, regional and engineering deformation observation is employed as inputs for wavelet decomposition; contents from different frequency scales are obtained at different layers. Deformation trend and rapid deformation changes are found from this multiple inspection transformation. Practical examples are given to reveal the feasibility of wavelet decomposition as a useful inspection tool for deformation analysis. From these work, we come to see that AR approach of time serial is fit for modeling and prediction, while wavelet transform is more flexible in deep inspection of deformation details and can exhibit subtle variation in observation serials. So some comprehensive comparisons are made in terms of time domain and spectrum domain to summarize merits and demerits of both methods. Practical data from field using some instruments are used for analysis and validation to verify the flexibility of suggested models.

Keywords: engineering deformation, time serial, ARMA model, simulation and prediction, wavelet transform, deformation analysis, extraction and identification, deformation monitoring, GPS

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No. 607-1

A Study on Ontology-Driven Geospatial-Information Retrieving in the Semantic Web

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ABSTRACT

Firstly, this paper expounded that the traditional searching based on keywords has a severe deficiency on Recall and Precision because the computer can't understand what information mean efficiently. In Succession, through extending from ordinary information to Geo-spatial information, on the support of geo-ontology theory and semantic web services technology, this paper discussed the principle, methods and application of ontology-driven geo-spatial information retrieving mechanism in semantic web. In other word, How to structure the framework for running this mechanism, how to build the ontology information models and how to establish the ontology-driven services models are discussed in detail in context. A design of systems for implementing the mechanism and experiment are given at the end of the text.

Keywords: Semantic Web, Geo-Ontology, Intelligent Search Engine, Semantic Web Services, Geography Cognize, Processing platform of Knowledge

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No. 607-2

The Design and Implementation of Urban Earthquake Disaster Loss Evaluation and Emergency Response Decision Support Systems Based on GIS

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ABSTRACT

Based on the necessity analysis of GIS applications in earthquake disaster prevention, this paper has deeply discussed the spatial integration scheme of urban earthquake disaster loss evaluation models and visualization technologies by using the network development methods such as COM/DCOM, ActiveX and ASP, as well as the spatial database development methods such as OO4O and ArcSDE based on ArcGIS software packages. Meanwhile, according to Software Engineering principles, a solution of Urban Earthquake Emergency Response Decision Support Systems based on GIS technologies have also been proposed, which include the systems logical structures, the technical routes ,the system realization methods and function structures etc. Finally, the testing systems user interfaces have also been offered in the paper.

Keywords: GIS; Model Integration; OO4O; Decision Support Systems

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No. 608

A Genetic Algorithm Based Wrapper Feature Selection Method for Classification of Hyperspectral Images Using Support Vector Machine

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ABSTRACT

The high-dimensional feature vectors of hyper spectral data often impose a high computational cost as well as the risk of "over fitting" when classification is performed. Therefore it is necessary to reduce the dimensionality through ways like feature selection. Currently, there are two kinds of feature selection methods: filter methods and wrapper methods. The former kind requires no feedback from classifiers and estimates the classification performance indirectly. The latter kind evaluates the "goodness" of selected feature subset directly based on the classification accuracy. Many experimental results have proved that the wrapper methods can yield better performance, although they have the disadvantage of high computational cost. In this paper, we present a Genetic Algorithm (GA) based wrapper method for classification of hyper spectral data using Support Vector Machine (SVM), a state-of-art classifier that has found success in a variety of areas. The genetic algorithm (GA), which seeks to solve optimization problems using the methods of evolution, specifically survival of the fittest, was used to optimize both the feature subset, i.e. band subset, of hyper spectral data and SVM kernel parameters simultaneously. A special strategy was adopted to reduce computation cost caused by the high-dimensional feature vectors of hyper spectral data when the feature subset part of chromosome was designed. The GA-SVM method was realized using the ENVI/IDL language, and was then tested by applying to a HYPERION hyper spectral image. Comparison of the optimized results and the un-optimized results showed that the GA-SVM method could significantly reduce the computation cost while improving the classification accuracy. The number of bands used for classification was reduced from 198 to 13, while the classification accuracy increased from 88.81% to 92.51%. The optimized values of the two SVM kernel parameters were 95.0297 and 0.2021, respectively, which were different from the default values as used in the ENVI software. In conclusion, the proposed wrapper feature selection method GA-SVM can optimize feature subsets and SVM kernel parameters at the same time, therefore can be applied in feature selection of the hyper spectral data.

Keywords: feature selection, Hyperspectral, Genetic Algorithm, Supported Vector Machine

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No. 609

A Study on Heterogeneous Distributed Spatial Information Platform Based on Semantic Web Services

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ABSTRACT

With the development of Semantic Web technology, the spatial information service based on ontology is an effective way for sharing and interoperation of heterogeneous information resources in the distributed network environment. This paper discusses spatial information sharing and interoperability in the Semantic Web Services architecture. Through using Ontology record spatial information in sharing knowledge system, explicit and formalization expresses the default and the concealment semantic information. It provides the prerequisite for spatial information sharing and interoperability; Through Semantic Web Services technology parses Ontology and intelligent buildings services under network environment, form a network of services. In order to realize the practical applications of spatial information sharing and interoperation in different brunches of CDC system, a prototype system for HIV/AIDS information sharing based on geo-ontology has also been developed by using the methods described above.

Keywords: Semantic Web Services; Geo-Ontology; spatial information Interoperation and Integration

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No. 610

Design and Implementation of LUPMIS based on the customized GIS-Document Workflow

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ABSTRACT

This paper studied on the organization model, process model, function model and information model of GIS-Document Workflow from the factual demands of LUPMIS, and respectively put forward some new concepts as map operating roles, GIS-Document activities, GIS-Document functions and GIS-Document information. To improve the inflexibility in traditional workflow techniques, the paper presented several crucial techniques which realized the flexible customization for the form data and business processes. Moreover, the customized GIS-Document Workflow was implemented in Kunming LUPMIS by means of .NET, ArcEngine and Oracle 9.2i. The practice indicated that LUPMIS based on the customized GIS-Document Workflow well integrated workflow and GIS as well as effectively reduced repetitious work of developers and administrators in case the workflow was changed.

Keywords: LUPMIS, GIS-Document Workflow, GIS-Document Workflow model, GIS, Kunming

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No. 611

Distributed Spatial Information Integration Based on Web Service

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ABSTRACT

Spatial information systems and spatial information in different geographic locations usually belong to different organizations. They are distributed and often heterogeneous and independent from each other. This leads to the fact that many isolated spatial information islands are formed, reducing the efficiency of information utilization. In order to address this issue, we present a method for effective spatial information integration based on web service. The method applies asynchronous invocation of web service and dynamic invocation of web service to implement distributed, parallel execution of web map services. All isolated information islands are connected by the dispatcher of web service and its registration database to form a uniform collaborative system. According to the web service registration database, the dispatcher of web services can dynamically invoke each web map service through an asynchronous delegating mechanism. All of the web map services can be executed at the same time. When each web map service is done, an image will be returned to the dispatcher. After all of the web services are done, all images are transparently overlaid together in the dispatcher. Thus, users can browse and analyze the integrated spatial information. Experiments demonstrate that the utilization rate of spatial information resources is significantly raised thought the proposed method of distributed spatial information integration.

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No. 612

Study on multi-scale urban planning supported by spatial information technology

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ABSTRACT

Considering the demand of urban and rural planning and the characteristics of spatial information technology (SIT), the study focuses on the application of SIT to support multi-scale urban planning. Three scales of urban and rural planning, such as city and town system planning, urban master planning, and detailed urban planning, were studied based on SIT. Firstly, tacking Great Beijing Region as an example, which includes Beijing, Tianjin, and northern of Hebei province, the city and town system planning was studied, supported by the theory of spatial interaction between cities and towns, and GIS spatial analysis. Then, for the urban master planning of Beijing, the RS and GIS were applied to do the spatial development analysis based on RS image data and GIS spatial analysis. Regarding to the conservation planning of Beijing's Inner city, the third scale is detailed urban planning. RS, GIS, and VR were integrated to determine the conservation region and digital conservation way as well. Finally, three conclusions were worked out.

Keywords: Multi-scale Urban Planning, Spatial Information Technology, GIS, Remote Sensing, Virtual Reality

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No. 613

A Hydrological Model based on Cellular Automata and Doppler Radar

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ABSTRACT

Distributed hydrological model(DHM) has been the key research currently in hydrology integrated with digital elevation model(DEM), geographic information system(GIS) and Remote Sensing(RS). Besides these technologies, this paper proposes a hydrological model by integrating cellular automata (CA) and Doppler radar. CA are a kind of bottom-up approaches and can be used to simulate complex hydrological processes. Doppler radar has provided a key input about the precipitation with high resolution to the river discharge simulation. The proposed model has been applied to the Huang Longdai basin in Guangdong with satisfactory results.

Keywords: Cellular automata, Doppler radar, Distributed hydrological model, GIS

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No. 614

Implementation of Open Source Web-based GIS and Database Tools for Emergency Response

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ABSTRACT

Natural hazards (i.e. earthquakes, floods) become disaster when they strike the man-made environment. China has frequently experienced various types of severe natural disasters which result in considerable loss of life and extensive economic damage. To effectively reduce the impact of every disaster, available data f buildings, lifeline systems, roads, hospitals and etc, and such data will help the managers to better decision-making. The objective of this study is to examine the applicability of web-based open-source geographical information systems for sharing and distribution of data for emergency response operations. The first objective for this study is to conduct a desk research to identify information needs of the emergency response community. The second objective is to build and test an open-source web-based GIS. The third objective is to analyze the results generated by the prototype in the light of the information needs and technical issues. Therefore, a Geographical Information System (GIS) can support disaster management as a powerful tool for collecting, storing, analysis, modeling, displaying large amount of data and decision making purposes.

Keywords: Web based GIS; Open source GISs; Database; Emergency Response.

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No. 615

A Storing Approach of Spatial Visualizing Database Based on XML-SVG

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ABSTRACT

As a network standard of graphic visualization, SVG (Scalable Vector Graphics) faces an uncompleted representation of spatial information such as spatial position, spatial relations and map symbols and map decoration. And it's either impossible to avoid a great capacity of spatial data processing which slowed down the executing speed of the system on client side. Thus, a SVG-based visualizing database has been proposed as the solution for managing all the graphics and its attributes of SVG document in a DBMS for Web GIS. The experimental results of the solution shown, 1) it improves the efficiency of visualizing data transforming and displaying and saves at least half of the implementing time; 2) it provides an operation in element level based on the designed database structure by selecting the medium granularity as a storing node; 3) the storing scheme can hold the characteristics of spatial information including spatial position, spatial relations and map symbols and map decoration by the comparison of both data in document and in the database; 4) it showed an advantage of the interactive operation with connecting multiply scale of data layers; 5) the database can creates an externally stored scheme which makes a directly connection between spatial graphic object and joining attribute database.

Keywords: XML-SVG, Spatial visualizing database, WEB GIS

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No. 616

Progressive Street Networks

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ABSTRACT

The multi-scale representation model and the corresponding generalization method for constructing it are two key issues involved in the progressive transmission of vector map data. In this paper, the characteristics of existing approaches to the generalization of streets are summarized based on an analysis of the literature. A progressive street network representation model is introduced. Information theory has been applied for a better understanding of why and when to generalize. The metric information, topological information and thematic information are quantified for the street network. A progressive generalization algorithm of street network based on information theory is investigated. An experiment is also conducted on an urban street network map from the Compilation specifications for 1:25000 1:50000 topographic maps (GB 12343-90). This paper tries to state that progressive representation needs the support from corresponding progressive generalization algorithm and tries to introduce information theory to solve the problem of "how to generalize".

Keywords: Progressive transmission, vector data, generalization of street network, multi-scale representation, progressive representation, progressive generalization, entire street, entropy, information loss, dual graph

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No. 617

Fragmentation of Urban Forms and the Environmental Consequences: Results from a High-Spatial Resolution Model System

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ABSTRACT

Each city has its unique urban form. The importance of urban form on sustainable development has been recognized in recent years. Traditionally, air quality modelling in a city is in a mesoscale with grid resolution of kilometers, regardless of its urban form. This paper introduces a GIS-based air quality and noise model system developed to study the built environment of highly compact urban forms. Compared with traditional mesoscale air quality model system, the present model system has a higher spatial resolution down to individual buildings along both sides of the street. Applying the developed model system in the Macao Peninsula with highly compact urban forms, the average spatial resolution of input and output data is as high as 174 receptor points per km^2. Based on this input/output dataset with a high spatial resolution, this study shows that even the highly compact urban forms can be fragmented into a very small geographic scale of less than 3 km^2. This is due to the significant temporal variation of urban development. The variation of urban form in each fragment in turn affects air dispersion, traffic condition, and thus air quality and noise in a measurable scale.

Keywords: Spatial resolution, GIS, urban form, traffic, air quality, vehicle chase

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No. 618

Coupling Multi-Agent System and Small World Network Simulate Epidemic Spatio-temporal Transmission

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ABSTRACT

A new model is proposed based on Multi-Agent System and Small World Network to simulate spatio-temporal transmission process of infectious diseases. The model consists of following four components: attributes definitions, neighborhood, movement rules and state transition rules. Two new parameters, infection dose decay rate and distance index, are introduced in transmission process, and the effect of spatio-temporal is explicitly considered. This model is used to simulate transmission process of infectious diseases in Haizhu district of Guangzhou City. It is found that the higher dregee agents have, the more probability of infection happens.

Keywords: Multi-Agent System; Small World Network; Epidemic Spatio-temporal Transmission Simulation

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No. 619

Mapping Color Relief Shading based on DEM

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ABSTRACT

This paper discusses the theory and technology of the digital color relief shading mapping, and the theory and method for the digital relief shading. The paper introduces basic method of designing digital color relief shading, and discusses key technology of digital color relief shading, and provides scientific approaches of mapping relief shading based on DEM.

Keywords: digital relief shading; color relief shading; DEM

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No. 620

Design and Compilation of "Digital Atlas of Regional Development in China"

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ABSTRACT

In this paper, the overall design of "The digital atlas of regional development in China" , topical design, structural design, map groups and the laws reflected, and the function of "E-Atlas" were discussed.

Keywords: digital maps, map design, regional development

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No. 621

Research of Spatial Structure of Land-use Change Based on RS and GIS Technology

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ABSTRACT

Based on DOM, we use remote sensing (RS) and GIS technology to conduct a macro-description and micro-quantitative analysis research on the dynamic change of Guangzhou City's land-use. We first of all extract the information of Guangzhou City's land-use change, study on a general scale the situations of land-use change in all districts of Guangzhou City, and build a model related to the dynamic change of land-use. Then we analyze the mutual conversions between each land-use type and try to find out the reasons for the conversions. The results show that: The absolute volume of Guangzhou City's land-use type change is huge, in which conversions within the first land-use type predominate; the farmland decrease relatively fast and adjustable land-use type increase substantially. This paper offers some reference to the rapidly-developing urban land-use.

Keywords: land-use; remote sensing and GIS engineering; dynamic change

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No. 622

Measuring the Suburbanization of Shanghai Based on GIS

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ABSTRACT

In this paper, the spatial changes of suburbanization is analyzed in Shanghai by selecting industrial and residential data layers upon the land-use data of Shanghai in 1979, 1988, 2000 which interpreted from remote sensing data. First, industrial and residential land-use data in different time were overlaid in ArcGIS to reflect changes of spatial distribution. Second, the distribution of industrial and residential land-use was mapped for different time by concentric analysis sector of ARCGIS so as to measure the rate and nature of industrial and residential land-use changes from 1979 to 2000 in Shanghai. Third, the expansion strength of industrial and residential land-use in Shanghai was measured by ArcGIS grid analysis to classify the expanding rate of industrial and residential land-use into six grades: very fast expansion、fast expansion、medium-fast expansion、slow expansion、none expansion and reverse expansion.

Keywords: Suburbanization, Shanghai, Land-use, ArcGIS

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No. 623

Influence of land-use changes on soil erosion based on geo-information Tupu theory in Zhujiang Delta

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ABSTRACT

This paper improved the traditional method of researching soil loss changes based on land-use dynamic changes, geo-information Tupu theory was introduced in to study the heterogeneity of soil erosion caused by land-use changes. With the example of Zhujiang Delta, we investigated the land-use changes and soil erosion changes over the period from 1998 to 2006. The results showed: the soil erosion intension aggravated in recent years, the average amount of soil erosion in 2006 was as much as 1.5 times of that in 1998; the change of land-use was the main reason for the change of soil erosion, and the diversity of soil erosion varied obviously with the transformation of land-use patterns; especially, soil erosion changed sharply with the mutual transformation between developing area or sand land and other land-use types correspondingly.

Keywords: soil erosion, land-use change, Tupu, Zhujiang Delta

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No. 625

Flat-earth phase removal algorithm improved with frequency information of interferogram

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ABSTRACT

As is well known, Interferometric synthetic aperture radar (InSAR) has been widely used in remote sensing field, which can reflect actual topographic trend or possible surface deformation. The precision of interferometric phase is critical to the final measurement. Due to the orbit attitude influence, such phase difference between the scattering elements on the same height level, which is named as flat-earth phase, usually causes the complex interferogram dense and difficult to be used in further procedures. Before phase unwrapping, interferogram must be flattened to derive accurate topographic or deformation information. Traditional methods pose problem to retrieve accurate flat-earth phase, which finally lead to inaccurate elevation or deformation information. A new algorithm of flat-earth phase removal is proposed in this paper based on SAR satellite system geometry and spectrum information of actual interferogram. The basic procedure of the method is firstly introduced and then the test results are following listed. From the comparison between the new algorithm and conventional ones, some advantages can be easily shown: The whole calculation can be easily understood and applied; accurate flat-earth phase can be retrieved and removed not only airborne SAR image but also satellite SAR image, which will improves the quality of complex interferogram to be well unwrapped;

Keywords: Flat-earth effect; Complex Interferogram; interferometric synthetic aperture radar (InSAR); Frequency shift

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No. 626

A Method of Generating Moving Objects on the Constrained Network

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ABSTRACT

Moving objects databases have become an important research issue in recent years. In case large real data sets acquired by GPS, PDA or other mobile devices are not available, benchmarking requires the generation of artificial data sets following the real-world behavior of spatial objects that change their locations over time. In the field of spatiotemporal databases, a number of publications about the generation of test data are restricted to few papers. However, most of the existing moving-object generators assume a fixed and often unrealistic mobility model and do not consider several important characteristics of the network. In this paper, a new generator is presented to solve these problems. First of all, the network is realistic transportation network of Guangzhou. Second, the observation records of vehicle flow are available. Third, in order to simplify the whole simulation process and to help us visualize the process, this framework is built under .Net development platform of Microsoft and ArcEngine9 environment.

Keywords: Moving object, Vehicles turning Control, road network, transportation flow

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No. 627

Fast information extraction of urban built-up areas based on Multitemporal Landast imagery

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ABSTRACT

The Remote sensing technology is playing a more and more important role in monitoring and detecting land cover changes. In this paper we propose a new methodology based on multitemporal Landsat images, NDVI (Normalized Difference Vegetation Index), NDBI (Normalized Difference Built-up Index), MNDWI (Modified Normalized Difference Water Index), and SAVI (Soil Adjusted Vegetation Index) to automate the extracting process of urban area. By analyzing different normalized indices, we take advantage of their spectrum features to extract the urban area. By using this new method, not only the work load of manual supervises classification is greatly reduced, but also, it has a high level accuracy which exceeds 94%. Comparing with the previous methods (e.g. maximum likelihood or other muti-indices methods), it is able to serve as a fast, simple and accurate approach to obtain the ideal classified image of built-up area.

Keywords: urban built-up area, information extraction, NDVI, NDBI, MNDWI, SAVI.

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No. 629

A Method Based on Interest Operator to Transform LiDAT Data into Grey Image

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ABSTRACT

Image analysis tools can be used to extract ground information from grey image which transformed from LiDAR point cloud. In this paper, a new algorithm based on interest value is presented to process the LiDAR data. According to this algorithm, the values of slope between each hit point pair within one grid are calculated. Then the feature point is chosen by interest value. At last, the grid elevation value is transformed into grey scale value. By utilizing the interest value, the optimal grid step can be obtained, and the principle components of point cloud slope information is reserved in grey image transformed by this algorithm. A set of LiDAR data of a tidal flat area, as a study area, are transformed into grey image by using interest value, and then edge detection and texture analysis are preformed to extract shoreline and low vegetation. Comparing with the results exported from other methods, experiments show that the algorithm based on interest value is better than the conventional methods. And it is possible that additional ground feature information such as texture information can be extracted from the interest grey image if appropriate image analysis tools are used.

Keywords: LiDAR, interest algorithm, transformation, grey image, texture analyse

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No. 630

Applying Genetic Algorithms to space optimization decision of farmland bio-energy intensive utilization

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ABSTRACT

The development of bio-energy intensive utilization of farmland is to solve China's emerging issues related to energy and environment in an important way. Given the spatial distribution of bio-energy is scattered, not continuous, the intensive utilization of farmland bio-energy is different from that of the traditional energy, i.e. coal, oil, natural gas, etc.. The estimation of biomass, the spatial distribution and the space optimization study are the key for practical applications to develop bio-energy intensive utilization. Based on a case study conducted in Guangdong province, China, this paper provides a framework that estimates available biomass and analyzes its distribution pattern in the established NPP model quickly; it also builds the primary collection ranges by Thiessen polygon in different scales. The application of Genetic Algorithms (GA) to the optimization and space decision of bio-energy intensive utilization is one of the key deliveries. The result shows that GA and GIS integration model for resolving domain-point supply and field demand has obvious advantages. A key finding presents that the model simulation results have enormous impact by the MUAP. When Thiessen polygon scale with 10 KM proximal threshold is established as the primary collecting scope of bio-energy, the fitness value can be maximized in the optimized process. In short, the optimized model can provide an effective solution to farmland bio-energy spatial optimization.

Keywords: bio-energy, NPP, spatial optimization, Genetic Algorithms, MUAP

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No. 631

Water Pollution Remote Sensing for Pearl River Delta

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ABSTRACT

Water pollution on the Delta of Pearl River is increasingly serious and to command the fact of pollution is the key of the control. A remote sensing model for water pollution base on single scattering is deduced in this paper. To avoid the effect by turbidity of water, by analysis the characteristics of the energy composition of multiple scattering, a factor of second scattering is deduced to build a double scattering model, and the practical arithmetic for the calculation of the model is put forwarded and then used to the pollution remote sensing over the Pearl River Delta. The precision of the result is validated by the synchronous measured data on water surface. The result of remote sensing showed that all of the North River, East River and West River are polluted in Pearl River Delta, and the most serious pollution is take place around Guang Zhou City and Dong Guan City.

Keywords: remote sensing, water pollution, double scattering, Pearl River Delta

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No. 632

A new approach for subsurface space mapping of urban area using RS and GIS

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ABSTRACT

The high resolution images are taken as the information source to attempt the inversion detection of the spatial resources use in the investigation area. Through visual interpretation of geometry shape of the remote sensing data, inquiry of historical archives of city planning department and in situ investigation, confirmation, analysis of each region, the distinction pattern of relations between the structure height, the structure style and the depth of the foundation ditch is established. Afterwards, the spatial distribution of the construction in Hangzhou urban area is interpreted. On the basis of the foundation pattern used by the construction and correlating distinction pattern, the used subsurface space structure is determined with the help of GIS spatial statistical analysis technology. The result can provide macroscopic information for investigating usable subsurface space resources. It also can assist the engineering geology and hydrology geology data to establish full and accurate analysis of subsurface space use, which provide the policy-making suggestion for the cultural relics preservation and the important project using subsurface space such as the subway construction.

Keywords: surface space mapping, remote sensing, geographic information system, urban area

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No. 633

A fast checking algorithm of overlay, repetition and disjoint errors in land spatial data

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ABSTRACT

While in land spatial data processing or application, spatial relationship of land data features should be carefully checked to guarantee the data quality. For land use data or cadastral data, lots of spatial relation rules need GIS query functions to find the overlay or disjoint feature errors, for example, all the land use patches must conform to combine a non-overlay, non-repetition and continuous area. Currently, there are many types of spatial relationship like equality, contain, intersect, disjoint, overlay, contact etc, which can be utilized in GIS systems. Though each of them can find different data errors, they require in turn examining every pair of features separately and will be very time-consuming, especially when land use data contains large number of features or lots of the feature shapes are complicated, so for land spatial data management system, a fast algorithm is needed to systematically check variant data errors in a short time. In this paper, a new land data checking algorithm of overlay, repetition and disjoint errors is proposed. The main concept and detail steps of this algorithm are introduced and illustrated. Then an experiment on comparing this algorithm and a common algorithm which uses spatial query functions of GIS software in checking overlap, repetition, and disjoint errors for land use data is carried out. Results show that this algorithm has high effiency than the other one.

Keywords: Land spatial data, data checking, spatial relation, fast algorithm

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No. 634

Spatial statistics and GIS application study in spatial variability analysis of houses' prices: a case study of Dongguan

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ABSTRACT

According as general houses' prices data, this paper, based on spatial analysis function of Geographic information system(GIS), using semi-variogram of spatial statistics, studies spatial heterogeneity of general houses' prices distribution in Dongguan quantitatively. The results from the analysis indicate: general houses' prices have both spatial autocorrelation and sometime local spatial heterogeneity, it can be found that the spatial distribution of general houses' prices takes on a zonal anisotropy by anisotropic variability analysis, which means that there are different structural characteristics in different directions for general houses' prices distribution; isotropic variability analysis reveals that: the semi-variogram of general houses' prices distribution in Dongguan is best described by spherical model, changes of general houses' prices distribution are affected by both structural and random factors; the ratio of random variance (nugget) to total variance(sill) is 37.5%, therefore the spatial correlation of general houses' prices is a kind of medium correlation with Nugget/ Sill being between 25%～75%, its spatial correlation range is 16.62 kilometres; the ratio of structure variance(partial sill) to total variance is higher than the ratio of random variance to total variance, this means that certain factors' contributions to the spatial variability of houses' prices is more than random factors' contributions.

Keywords: spatial statistics, semi-variance function, houses' prices, spatial variability, Dongguan city

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No. 635

GIS- and RS-based land use and land cover analysis - case study Rur-Watershed, Germany

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ABSTRACT

For numerous spatial applications, land use data are of central importance and have to be available in a spatial data infrastructure for regional modeling. This also counts for the research project TR32 which focuses on SVA modeling in a regional context. The land use data should be organized in a land use information system according to international data standards providing general metadata including information about data quality. Usually, land use data are available from official sources, but they lack the desired information detail for many purposes. For example, in official land use maps, agricultural land use is generally differentiated between arable land, grassland, orchards and some special land use classes like paddy fields. For detailed (agro-)ecosystem modeling, this information resolution is rather poor. Here, disaggregated land use data which provide information about the major crops and crop rotations as well as management data like date of sowing, fertilization, irrigation, harvest etc. are needed. The analysis of multispectral, hyperspectral and/or radar data from satellite or airborne sensors is a standard method to retrieve such kind of information with remote sensing methodologies. By using a Multi-Data Approach (MDA), the retrieved information from remote sensing analysis is integrated into official land use data by GIS technologies to enhance both the information level (e. g. crop rotations) of existing land use data and the quality of the land use classification.

Keywords: land use, land cover, GIS, RS, analysis

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No. 636

Understanding regional development mechanisms in Greater Beijing Area, China, 1995 – 2001, from a spatial-temporal perspective

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ABSTRACT

Due to its rapid economic gains in recent decades, the patterns, mechanisms and extents of China's regional development have recently attracted scholarly attentions. Multi-scalar and multi-mechanism are proposed as crucial approaches in China's regional studies. More advanced methodological development in GIS and spatial analysis also lends power to in-depth understanding of China's regional development. This study examines the development mechanisms from a spatial-temporal perspective in Greater Beijing Area (GBA), China, which includes Beijing and Tianjin provincial level municipalities and Hebei Province, and is one of China's most active regions during the later reform period. In particular, with panel data of GBA from 1995 to 2001 at county level, the study intends to apply a spatial panel regression analysis to study the well identified regional development mechanisms, namely, institutional factors, globalization and urbanization. Based on the panel data analysis, a tentative geographically and temporally weighted regression (GTWR) is also proposed to explore the potentially varying relationships between economic development and its mechanisms from a space-time standpoint. Results from the analyses are quite interesting. First, when urbanization seems to hinder regional development in GBA with cross-sectional analysis, the panel analysis by taking into account the possible spatial autocorrelation and individual effects indicates that urbanization indeed contributes to GBA's development in the 7 year span. Per capita foreign investment, which was usually deemed one of the major factors of globalization and a financial engine for regional development in the reform China, turns out to be a negligible effect in GBA's development. While among all the development mechanisms, the government's financial capability seems to dominate the regional development in GBA. GTWR analysis further revealed potential non-stationary relationships among the modeled variables, indicating that the functions of regional development mechanisms are inherently heterogeneous both spatially and temporally in GBA.

Keywords: Greater Beijing Area, Regional Development, Mechanisms, Spatial Panel Regression, Geographically and Temporally Weighted Regression

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No. 637

Sensitivity of Landsat MSS and TM to land cover change in the Golden Horseshoe, Ontario, Canada

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ABSTRACT

An ideal situation for conducting change detection is to use multi-temporal images acquired from the same sensor. However, many conditions (such as the discontinuity of sensors, weather conditions) would bring an end to the ideal temporal change detection. Imagery availability issues will force change detection studies in the future to increasingly incorporate multiple sensors. This study conducted change detection between Landsat TM (TM) and Landsat MSS (MSS) images from July 30, 1995 to June 2, 2003. The study area was centered on the Greater Toronto Area (GTA) in south-central Ontario, Canada. Post-classification change detection was used to determine the type of change between the images. Results demonstrated that despite the different spatial resolution of the MSS and TM data, the change detection using both MSS and TM was similar in results to that of TM alone. A change detection where MSS is resampled to 30 meters was most effective in capturing the amount and type of change in the TM change study.

Keywords: Change detection, land use/cover, image classification, TM, MSS

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No. 638

Delimitating Central Areas of Cities Based on Road Density: A Case Study of Guangzhou City

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ABSTRACT

The central area of a city is an important functional unit in many urban studies. It is a region where business concentrates and municipal facilities densely distribute. Traditionally, statistics of economic and social phenomena can be used to delimitate their boundaries. However, traditional methods based on economic and social investigation are labor-intensive and sometimes inaccurate. Alternatively, road networks acting as a kind of infrastructure reflect the association of locations. Thus the concentration of road networks indicates the congestion of social-economic activities and municipal facilities to some extent. Based on density analysis of road networks, the area where roads densely distribute is recognized as the central area of a city. Taking Guangzhou City as an example, the road network was studied on a set of spatial scopes, and the central area was delimitated and analyzed. Results showed that the road-density-based delimitation had to be adjusted according to the road system, and the delimitated area was consistent to the real central area to some extent. Since road data is much accessible, road-based method is useful and practical when short of social-economic data.

Keywords: Central areas of cities, Central business district, Road network, Kernel Density Estimation

Author Index

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—N—

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