

CHROMA: A Content-Based Image Retrieval System

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CHROMA is a full-scale prototype system to improve on the inadequacies of current content-based image retrieval systems. A primary goal of the development of this system is to provide more effective methods of meeting the requirements of various retrieval tasks.

A number of current systems, such as QBIC [1], focus on the query-based strategies using similarity measures of image features. However, recent research [4] suggests that there is a need for the development of structured browsing and navigation methods to improve retrieval effectiveness. It may help users to construct a precise query while they only have a vague idea at the pre-search stage; and may help them to refine, narrow and reformulate the queries at the post-search stage.

The unique feature of the system is the introduction of the perceptual colour groups [3, 4] for transforming natural colours in photographs. Recent research [2, 3] suggests that it may improve the problems of intrinsic colour appearance which result in difficulties with using colour features, such as the influence of various lighting conditions, and shadows and reflection. Based on the perceptual colour model we define a hierarchical classification model which can be generated by an automatic indexing scheme.

In addition, a suitable interactive user interface is needed to assist users to describe the complex image contents. It should be easy for users to learn and use. Currently, the CHROMA system provides three major retrieval methods: navigation using hierarchical classification, query-by-sketch, and query-by-image-example.

A navigation tool is provided for users to navigate the hierarchical classification of the image collection. It is implemented as a tree-based structure in which colour descriptors are linked to each other hierarchically. The interface follows modern design style and as such should be easy to use. (See Figure 1)

A sketch tool allows users to construct a visual query example using colour appearance and their spatial relationships in photographs. A (mouse-driven) paintbrush can be used to sketch an approximate target image using patterns of perceptual colours.

The system also provides the most common query method, "query-by-image-example", which allows users to point out an appropriate images and retrieve some more images "visually" similar to the selected example.

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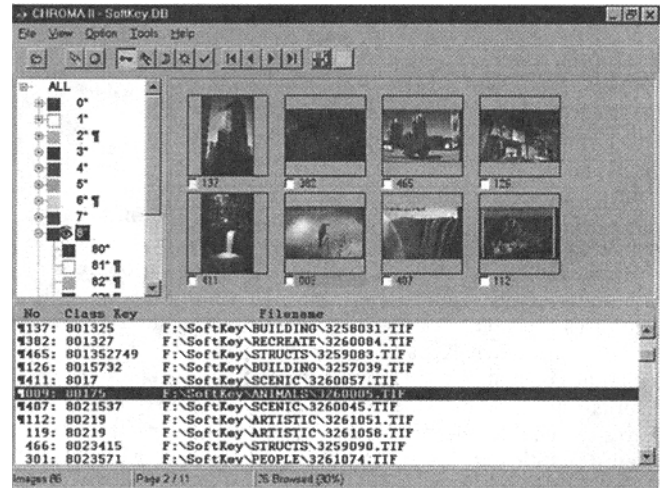


Figure 1. Layout of the System

We hope that users will find it easy to operate the visual query tools since the perceptual colour groups are used throughout the system. For example, they may not need to be concerned whether it is light or dark blue while describing a clear sky.

Furthermore, since browsing and navigation is an important retrieval strategy for image retrieval [4], we attempt to address the problem of re-visitation. The system will automatically tag each visited images, and also indicates the percentage of visited images in the collection. This design feature should help the users avoid re-visiting images, and indicate when to stop querying or browsing since the appropriate images do not exist.

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References

- [1] Flickner M., Sawhney, H., Niblack, W., et al. query by Image and Video Content: The QBIC system. *Computer*. Vol 28, No 9, 1995, 23-31.
- [2] Lai, T.-S., Tait, J. Using Global Colour Features for General Photographic Image Indexing and Retrieval. in *Proceedings of the 21st ACM SIGIR Conference, Melbourne, Australia, 24-28 August, 1998*, 349-350.
- [3] Lai, T.-S., Tait, J. General Photographic Image Retrieval Simulating Human Visual Perception. *Multimedia Indexing and Retrieval. A workshop held in conjunction with ACM SIGIR'98. Melbourne, Australia, 28 August, 1998*, 17-28.
- [4] Lai, T.-S., Tait, J., McDonald, S. Image Browsing and Navigation Using Hierarchical Classification. In *Proceedings: The Challenge of Image Retrieval. 25-26 February 1999, Newcastle upon Tyne, UK*.