From Documents to Applications via Frameworks: the Tools and Materials approach

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1 MOTIVATION

Object orientation claims to guide developers through the whole development process. But often object-oriented methods focus only on parts of the development process and describe a smooth transition for only one specific step of the process. They fail to provide a continuous and homogeneous way through an entire object-oriented project.

2 THE BASIC IDEA

The Tools & Materials approach (see [2]) guides the developer through the entire process. To realize this, it provides an application- and task-oriented methodology for software development. The main idea behind the approach is to realize high use quality of software. This involves the following aspects:

- The functionality of the system is oriented to the tasks of the application domain.
- Operation of the system is user-friendly.
- The process and steps defined in the system can be easily adapted to actual requirements in accordance with the work situation.

Based on object-oriented design and construction techniques, the T&M approach unifies various components such as a leitmotif with design metaphors, application-oriented documents and an evolutionary approach using prototyping. Even the implementation is supported by a complete Java-based application framework, called JWAM (WAM is a German acronym for the Tools & Materials approach).

The basic idea behind the approach is to achieve a structural similarity between the application domain and the software system. The benefit obtained is a close correspondence between the model of core application concepts and the software architecture. This structural similarity enhances maintainability, extensibility and other aspects of quality.

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3 A DOCUMENT-DRIVEN APPROACH

To guide the developer through the process, we use several design metaphors: Tools, Materials, Automata and the Work Environment. They help us to analyze the application domain and build a bridge from the application domain via object-oriented design to the technical implementation of the software system.

The approach is document-driven. Starting a new development cycle within an evolutionary process, we use a number of documents to analyze and mainly to understand the application domain. These documents are critically reviewed and revised in an author/critic cycle. Scenarios (corresponding to the Business Use Cases of the Unified Approach [4]) and glossaries are the documents of choice for describing the current work situation. A system vision (corresponding to Use Cases) then describes the design of the target system in application-oriented terms. These documents are complemented by prototypes. To understand and model the cooperative parts of work, we use cooperation diagrams. These are useful for modeling both the current situation and future workflows, including the new application system.

4 DESIGN PATTERNS

Describing the application domain using documents based on a common viewpoint and common design metaphors is the first step toward an software system. The second step is the design of the target software system using similar documents and the same design metaphors. The T&M approach guides the developer through these application-oriented tasks. The crucial next step is bridging the gap between the design and the technical construction of the software system. Here, the design metaphors are related to matching design patterns (see [3]). The Tools & Materials approach contains a set of appropriate design patterns for each metaphor, providing the developer with detailed instructions for object-oriented construction. A tool, for example, is realized by a specialized MVC pattern.

5 THE JWAM FRAMEWORK AS TECHNICAL BASIS

Building interactive application software is a nontrivial task. As the T&M approach is frequently used to build workplace systems, we have developed a sound technical basis for this type of system. Building on experience gained in industrial projects using the approach, we have developed the JWAM framework (see [5]). This Java-based framework contains an architectural infrastructure (the layer architecture, see [1]) as well as a number of predefined components and classes. The framework and the components are based on the design patterns of the T&M approach. Using the JWAM framework, a developer can easily implement materials, tools or automata and arrange them into a complete work environment. The framework provides an architecture supporting the integration of legacy systems and allowing a smooth transition to new object-oriented applications using modern techniques. The JWAM framework is, then, more than just a few superclasses for tools and materials. It objectifies a leading-edge, layered software architecture for interactive workplace systems.

6 CONCLUSION

The Tools & Materials approach guides the software developer through the entire development process using documents, design metaphors, design patterns and a Java-based framework. All of these components are based on the idea of application orientation. They are built for extensibility and flexibility, and they fit together perfectly.

Using the T&M approach in both research projects and in a large number of industrial projects, we have a very positive record of high-quality software produced on time and within budget. The approach has shown its strength in banking projects, for car-rental software as well as for sales-order management and other domains. During the past few years, the framework has evolved from a research project to a commercially usable piece of software.

7 REFERENCES

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