

An Object-Process Framework for Conceptual Modeling of Design Patterns

Galia Shlezinger

Abstract.

Design patterns describe reusable solutions to recurring design problems. They are frequently used by software designers as means to incorporate tested solutions, common knowledge, and experience into system designs. During the last decade, the use of design patterns has become very popular, and many design patterns have been published. The abundance of patterns and their partial specification hinder their appropriate use and the ability to differentiate among the various patterns, complicating the task of choosing the correct design pattern for a given design problem. In this research, we suggest a framework for modeling design patterns as complete units, including specification of the problems they intend to solve, the suggested solutions, and the appropriate usage of the design patterns within systems. This framework, which uses Object-Process Methodology (OPM) as its underlying specification language, captures the essence of the patterns rather than their implementation. A natural classification of design patterns was derived based on their OPM models. This classification contributes to effective application of design patterns in systems, as it is understandable, extensible, and may serve as a basis for retrieval of design patterns that are appropriate for the task at hand. Finally, we suggest a structure-based algorithm, which scans a system design, finds possible problems in it according to a repository of design pattern models, and proposes corrections that are based on suitable design patterns. Evaluating this algorithm on a repository of eight design patterns, we found that most of the problems are detected. However, additional, non-problematic candidates are also found, indicating that an algorithm that is based only on structure is not sufficient for this task, calling for incorporating semantics-based techniques.