

Semantic Links and Co-Evolution in Object-Oriented Software Development

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Abstract

This research focuses on the problem of the semantic linking and co-evolution of the different design diagrams and models of an object-oriented software application. The blueprint of an object-oriented software application consists mainly of models drawn in a modeling language. The state-of-the-art modeling language in object-oriented software development is the Unified Modeling Language (UML). Current UML case-tools do not support the linking and co-evolution of the different models in an adequate way. This results in less maintainable, reusable and understandable models which are nowadays only used as a kind of documentation. In the extreme case changes to the software application are not reflected in the different models and these become obsolete.

Our research hypothesis is: *Using decidable fragments of first order logic to express the different UML diagrams, enables the semantic linking of the different diagrams and models and enables the support of co-evolution which can be semi-automated, enhancing the reusability, maintainability and understandability of the design of the software application and of the software application in general.*

We propose to develop a formal framework to support the linking of the different diagrams and models within the software development life cycle (SDLC). The advantages of such a framework are: reasoning capabilities are provided, co-evolution is more guaranteed, adaptability of the design is improved and reuse and understandability of the software design increases. For this purpose, we investigate different fragments of first order logic such as Description Logic and Modal Logic. These logics, together with their decision methods result in a powerful combination. To support co-evolution of the design models in a semi-automatic way we investigate the query capabilities of these logic families.