Master Thesis

Ownership in Design Patterns

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Introduction   Since object-oriented programs with arbitrary object structures are usually hard to understand and potentially almost every object can modify or at least reference any other object through a chain of references it is difficult to reason about and maintain these programs. The Universe Type System is a new programming model and type system that tries to cope with the mentioned problems by structuring the heap space into several universes. By doing so, ownership and statically checkable control of references are possible.
In small examples the Universe Type System has proven to be a good choice in order to solve the above mentioned problems but since common software architectures usually consist of a huge and complicated object structure the question arises if the Universe Type System can also be easily applied to „real world" systems.

Goal of this Master thesis   is to apply the Universe Type System to the well known design patterns proposed by Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides. In this context, an evaluation of the Universe Type System is to be made in terms of applicability, implementation and possible limitations. A concrete implementation of all reviewed patterns using the Universe Type System and a comparison with other available ownership type systems is also part of the project. Additionally, a classification of all reviewed patterns will be made regarding the ease of applicability of the Universe Type System.

The main parts   of this project are:

1. Design pattern implementations with Java that make use of the Universe Type System.

2. A classification of the implemented patterns regarding the ease of applicability of the Universe Type System.

3. A review and comparison with other ownership type systems.

4. A report documenting the whole project.

Possible extensions include the review of not only design patterns but also architecture patterns (i.e. the J2EE Patterns) or the specification of a widely used framework with the Universe Type System (i.e. Enterprise Java Beans). To improve the pattern implementations, JML specifications might be helpful.