Master's Project

Runtime Support for Generics and Transfer in Universe Types

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Introduction The Universe Type system[1] and JML[3] allow a programmer to control aliasing and dependencies in object-oriented programs by applying an ownership relation to structure the object store. Generic Universe Types[2], an extension of the Universe Type system, supports the Java Generics from Java 1.5. Ownership transfer is a mechanism to support the transfer of objects from one owner to another.
The JML implementation supports static and runtime checks for non-generic types. For generics and ownership transfer static type checking is already implemented. The implementation for runtime checking for generics and for ownership transfer is not implemented yet. A specification for the runtime support for generics is already provided by Generic Universe Types.

The goal of this master's project is to extend the JML implementation of the Universe Type system with the runtime support for generics and ownership transfer.

The main parts of this project are:

1. Propose a design for the implementation of the runtime support for generics.

2. Propose a design for the runtime support for ownership transfer which includes
   - finding out, where ownership transfer takes place and
   - how to implement a function to transfer the owner from one object to another.

3. Combine the two proposed designs and

4. implement it in the common JML compiler.

Possible extensions for this project are:

1. Integrate the type systems for Generic Universe Types and ownership transfer.

2. Make a case study for the implemented system.

3. Implement runtime checking for uniqueness downcasts for ownership transfer.

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References

[1] W. Dietl, S. Drossopoulou, and P. Müller. Generic Universe Types. In *Foundations and Developments of Object-Oriented Languages (FOOL/WOOD '07)*, January 2007.

[2] W. Dietl and P. Müller. Universes: Lightweight ownership for JML. *Journal of Object Technology (JOT)*, 4(8):5–32, October 2005.

[3] Gary T. Leavens, K. Rustan M. Leino, Erik Poll, Clyde Ruby, and Bart Jacobs. JML: notations and tools supporting detailed design in Java. In *OOPSLA 2000 Companion, Minneapolis, Minnesota*, pages 105–106, 2000.