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On the Declarative Description of Concurrent Reflective Computation

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Abstract

The concurrent reflective computation model is recognized to be a useful framework for constructing reliable and easy-to-maintain concurrent and/or distributed system. Many applications have been constructed based on the framework. In order to construct such a system having more higher quality, it is required to give its specification as correct as possible.

This thesis proposes a method to give specifications for concurrent reflective computation in rewriting logic which can represent dynamic behaviours of concurrent and/or reactive systems declaratively. Furthermore those specifications are executable, the author constructs some example based on them and analyzes their properties.

In this thesis, two subjects are contained:

- The group-wide architecture is proposed as one of framework to construct concurrent reflective computational system. Making use of its modelling based on actor model, the author reconstructs it in rewriting logic. Based on the specification, an example is executed, and a property of the metalevel system is proved.

- The author gives an operational semantics of GAEA, organic programming language. Based on the semantics, a robot example is constructed and executed, and some properties of GAEA are analyzed.

This thesis shows that giving the specification of concurrent reflective computation in rewriting logic can be expected to understand the system itself and analyze its properties.

Key Words: **Concurrent Reflective Computation, Group-Wide Architecture, Operational Semantics, Organic Programming Language GAEA, Rewriting Logic**