An Implementation of UML State Machine Semantics for Model Checking

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Abstract

We present an efficient implementation of the UML (Unified Modelling Language) state machine semantics that can be used for model checking. The implementation is part of the ACF (Analyzer Component Framework), a heavily templatised C++ component framework for implementing model-checkers. ACF separates model checking *algorithms* from the formalism used for state machines (*generators*) and from the *storage* data structures used. It defines a simple successor interface for finite state automata that is used in state space generation. The implementation described here allows the use of UML collaboration diagrams as generators.

The implementation of UML state machine semantics provides for the handling of UML state diagrams, conversion of state diagrams to an efficient internal representation and the generation of successor states. The challenge in the implementation has been the efficient treatment of all different features of the UML state machine semantics.

The internal representation used for the state of a collaboration diagram is a tuple of states of single state machines. The state of a single state machine is turn a tuple describing the active state configuration of the state machine (the set of active states) and various pieces of information needed to support all the features of UML state machines (call events, history transitions, synch states etc.). Such tuples are stored in a way that allows fast generation of successors and compact storage (e.g. active state configuration and history information are stored as bit vectors).

References

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