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Simulation of State Machine Diagram based on Sequence Diagram

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Abstract

During system development, how to make sure that the system developed satisfies the user requirements and how to reduce the cost of system modification is very important issue. There are two methods for validation. One is testing, which compares the user requirements and result from code. It is easy to test, but it will cost a lot for system modification. Another one is simulation in system design stage, which makes a simulation based on user requirements, and it is a low cost alternative.

The objective for this paper is to find the detailed simulation trace information in state machine using sequence diagram. And state machine diagram express the states transition of one system component, but sequence diagram identifies the behavior within different system components. So the difficulty in process of implementation is state machine and sequence diagram have different system abstract hierarchy, therefore, it is impossible to combine them directly. To solve this problem, we use the method of heightening the abstract level of state machine diagram in the following way. In process of analysis, there are three steps: transformation, reduction and composition. And as a reference, sequence diagram should be used in reduction methods. But lots of information of the state machine will be removed in this process, so recovering the necessary information is one important step for simulation. Fig 1 shows the overall our approach.

Our approach allows one to perform the simulation by virtue of sequence diagram. The simulation operations are based on analyzing Labeled Transition System (LTS) models converted from UML state machine diagrams using a transformation approach we designed. For efficient analyzing LTS models, we adopt reduction and compositional analysis technique

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[1] in analysis procedure. In techniques by compositional minimization, also known as compositional reachability analysis, the search space is reduced by compositionally constructing the composite LTS where globally observable actions are abstracted out [2] [3]. And the simulation engine previously designed is used in the process of simulation.

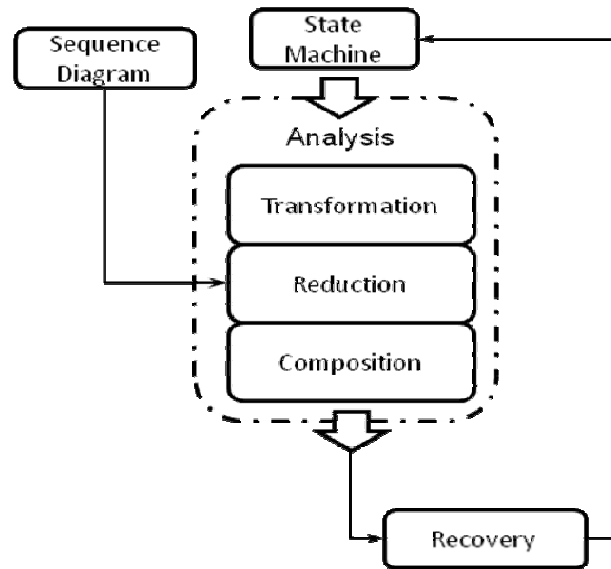


Fig 1 Overall approach of simulation based on sequence diagrams

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