MoMuT

A FAMILY OF TEST CASE GENERATORS

OVERVIEW

MoMuT::UML, MoMuT::TA, and MoMuT::SCADE are the founding members of a family of closely related test case generation tools. They all build on a common core technology, namely mutation-based test case generation, and bring this technology to different modeling languages.

The MoMuT tools combine mutation-based test case generation with standard techniques to deliver high quality test suites with an excellent cost/benefit ratio. Heart of this new technology is the concept of fault seeding or mutation. The tools use customizable mutation operators to derive mutated (faulty) models from the original test model. Given a mutant and the original test model, the tools then search for a sequence of inputs and outputs that uncovers any design implementing the mutant instead of the original.

Mutation-based test case generation is the most fine-grained and versatile test generation technique available today. It can not only be used to test functional properties of designs but also to generate tests that detect certain non-functional defects. Finally, it also allows the tools to know exactly which faults are caught by a particular test case and to analyze or extend existing test sets.

BENEFITS

▶ Automated and model-based test case generation
▶ Customizable and very fine grained **control** over the test **coverage** via fault models.
▶ **Assessment** and **extension** of an existing test suite.
▶ An optimized test suite for regression testing.
▶ **Fault location support** for failed regression tests
▶ Integration into existing workflow via OSLC.

Delivering improved software quality and reduced costs for testing, especially for **safety critical systems.**
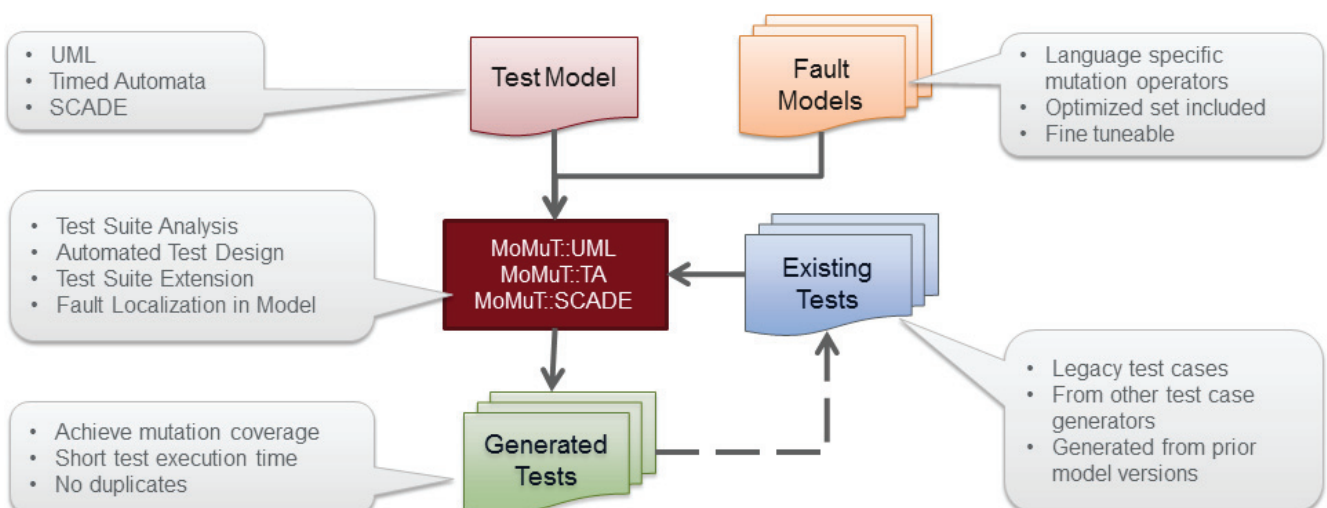
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TECHNOLOGY

MoMuT::UML was the first member of the product family. It uses UML state machine diagrams, class diagrams and stereotypes as an input and provides adaptive test cases as output. MoMuT::UML supports an almost complete sub-set of state machine elements, including orthogonal regions, nested states, all trigger types and OCL guards. Under specification and intentional non-determinism are supported as well. The conformance relation in use is the well-known input-output-conformance (IOCO).

MoMuT::TA uses Timed Automata as input language. Timed automata provide a very useful way of modeling a system's real-time behavior. They can be characterized as finite automatons extended with a finite set of real-valued clocks, leading to high expressiveness with respect to time. The modeling language is easy to grasp with clear and well defined semantics. The conformance relation in use is a real-time variant of IOCO.

MoMuT::SCADE, the youngest member of the product family, makes mutation testing available to the Esterel's SCADE Suite, further extending the powerful set of development tools available for the SCADE data flow modeling language. On the one hand MoMuT::SCADE can be used as a pure mutation engine to create mutated versions of a system model that can be used to check the quality of existing tests. On the other hand MoMuT::SCADE may use the standard model checker of SCADE to try and generate a discriminating test sequence for a given mutant. In contrast to the languages supported by the other family members, SCADE models are usually implementation models.

SERVICES

The MoMuT product family brings mutation-based test case generation to event based (UML), real-time (TA), and dataflow-centric (SCADE) modeling languages. It is actively maintained by a group of dedicated scientists and engineers at the AIT Austrian Institute of Technology in cooperation with Graz University of Technology.

In the context of model based testing, AIT offers the following services:

▶ Tool licenses
▶ Tool customization
   - Adaption to not yet supported development environments and UML editors
   - Extension to other modeling languages
▶ Consulting and support for
   - Introduction of model based testing
   - Integration into an existing workflow

Please contact us for further information.

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