

New contributions in the SoSym extension of the ICMT 2009 Paper:

First new contribution:

We integrate the notion of meta-model pruning into the approach to deal with large input meta-models such as the UML. The meta-model pruning algorithm prunes a large meta-model such as the UML. The result is an effective input meta-model that contains only required concepts and their obligatory dependencies precisely representing the input domain of a transformation under test. Further, the effective input meta-model is a supertype of the large input meta-model. All operations and instances of the effective input meta-model are also instances and operations of the large input meta-model. Transforming the effective input meta-model to Alloy results in a smaller set of signatures and facts making solving using Alloy highly scalable.

Second new contribution

The experiments performed in the ICMT 2009 paper do not study the effects of generating multiple solutions for the same test strategy. In this paper, we use Alloy's inherent symmetry breaking scheme to generate multiple non-isomorphic test models for the same test strategy. We demonstrate that despite generating multiple test models there is no drastic change in mutation score for different test strategies.

Third new contribution

Automatically generated test models helped us discover new pre-condition constraints in the model transformation case study. Automatically generated models often contain structures never foreseen by human experts who design pre-condition contracts for a model transformation. Models that generate exceptional behavior such as infinite looping or creation of invalid output models helped us detect patterns that were generalized to new pre-condition constraints. We enlist 9 such pre-condition constraints in the paper. Automatically generated models help us save an enormous amount of time to correctly specify the input domain of a model transformation. Many pre-conditions are detected through experience and years of use. Faults due to invalid specification of pre-conditions can lead to problems during the lifetime of a transformation resulting in several man-hours of debugging activity.