

Master Thesis

Guarantees for Reactions

In the Vitruvius approach to multi-domain modelling, different models of the same system are kept consistent by means of *Consistency-Preservation Rules* (CPRs), which are small programs written in a dedicated domain-specific language called *Reactions*. These take as input a model operation (i.e., a change of some model component) along with the current state of all models, and, if necessary, update a single other model to ensure consistency is preserved.

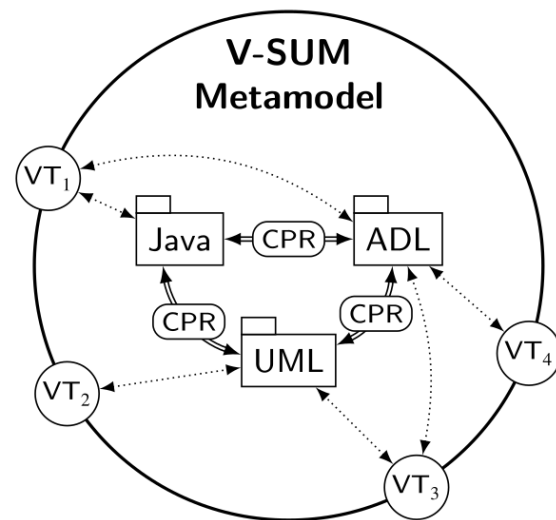
Crucially, as a result of one CPR, another may be triggered to update yet further models in a cascade. Since CPRs could thus trigger each other in a cycle, this process may not terminate.

As currently implemented, the Reactions language is based on the xtext framework, and may embed arbitrary Java code. This generality, while powerful, causes difficulty in reasoning about CPRs, and limits the ability to give guarantees about their behaviour.

This project's aim will be to explore defining a more constrained language in which to formulate reactions, so as to be able to give stronger guarantees about their behaviour. Possible directions are:

1. **Termination of Updates:** even if all CPRs are guaranteed to always terminate, the cascade of CPR applications triggered on a model update might cause a cycle.
2. **Typed transactions:** a CPR is restricted in what it can do by the metamodel of the model it updates: it must produce a well-formed model again. This may be expressed as a type system on reactions. Use such a system to determine statically whether a change may impact another model, or parts of another model, or whether it is guaranteed to remain the same beforehand.

Your Profile. You should have an interest in the theory of programming languages, and be curious about its applications to (model-driven) engineering.



Contact

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