Hybridize to Specify: institution-independent foundations for reconfigurable systems specification

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This talks aims to overview our recent works on the study and development of formal logics and semantics to specify *reconfigurable systems*, i.e., systems which behave differently in different modes of operation (often called *configurations*) and commute between them along their lifetime. In the suggested approach, models for reconfigurable software are structured transition systems described within appropriate logical systems. Their states corresponds to the individual configurations with whatever structure they have to bear in concrete applications. Transitions correspond to the admissible reconfigurations. This constitutes what we called the 'reconfigurations as transitions, configurations as local models' specification paradigm [4, 3]. Once chosen the semantics, the next issue concerns the definition of a suitable specification logic(s). Modal languages are the natural choice to talk about transition systems. Modal logic, however, is not expressive enough to deal with properties holding in specific states, a limitation which is overcome in hybrid logics [1] by considering a special set of symbols for naming states. Additionally, we need to specify the local configurations, at each state, as a model of a given (base) logic. The recent method for the hybridisation of institutions [6, 3] offer the source of logics for this specification. Concretely, it consists in a systematic method to extend arbitrary logics (formalized as institutions [2]) with hybrid logic features. Concretely, they are extended with Kripke semantics, for multi-modalities with arbitrary arities, as well as nominals and local satisfaction operators. The relevance of this generalisation step is in line with a basic engineering concern which recommends that the choice of a specification framework should depend on the nature of the requirements one has to deal with. For example, it may happen that, in a specific context, one would prefer to equip each local state with a partial algebra, a hidden algebra, a propositional valuation or even a hybrid logic model (since the method recurs).

On this talk we make an overview in the method, and we discuss a general construction of first-order encodings of hybridized institutions [6] as well as a suitable bisimulation notion for hybrid models [5].

References

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