Adhesive HLR Transformation Systems

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In this talk a new framework for the definition of semantic domains, which is a combination of transformation systems and adhesive high-level replacement (HLR) categories, is proposed. This framework is aimed at providing semantics for complex modelling techniques, where structural and behavioural aspects are modelled in an integrated way and, hence, traditional semantic domains such as algebras or labelled transition systems do not provide sufficient expressiveness.

A transformation system (see [GR04]), which is a concept for the integration of heterogeneous software specifications, consists of a data space with data states and data transformations and a control graph with control states and control transitions. Both, the data space and the control graph, are objects in the category of transition graphs, such that the category of all transformation systems over a given data space is a slice category as shown in Fig. 1.

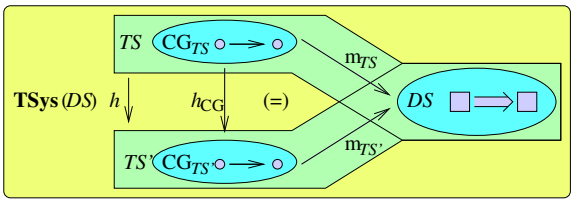

Figure 1: Category of transformation systems

In our approach, the data space as well as the control graph are defined by adhesive HLR systems (see [EEPT06]), which are a generalisation of graph transformations to objects in an arbitrary category. Hence, the instantiation of our framework is done by providing an adhesive HLR system for the data space, where the objects are the data states and the rules specify the data transformations, and a second adhesive HLR system, where the objects are control states and the rules describe the control transitions.

One notable difference to other approaches in this direction is that the rules of these adhesive HLR systems are fixed for the whole modelling technique. They are designed to interpret or execute given models and thereby provide a formal semantics for them.

The framework shall be instantiated for object-oriented systems to allow the definition of a formal semantics for UML and similar techniques. A first draft of this instantiation can be found in [BK06].

References

[BK06] Benjamin Braatz and Andreas Rayo Kniep. Integration of object-oriented modelling techniques, 2006. Draft version available from `http://tfs.cs.tu-berlin.de/~bbraatz/papers/BK06-TR.pdf`.

[EEPT06] Hartmut Ehrig, Karsten Ehrig, Ulrike Prange, and Gariele Taentzer. *Fundamentals of Algebraic Graph Transformation*. Monographs in Theoretical Computer Science. Springer, 2006.

[GR04] Martin Große-Rhode. *Semantic Integration of Heterogeneous Software Specifications*. Monographs in Theoretical Computer Science. Springer, 2004.