Domain specific modeling and analysis

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Summary

It is desirable to model software systems in such a way that analysis of the systems, and tool development for such analysis, is readily possible and feasible in the context of large scientific research projects. This thesis emphasizes the methodology that serves as a basis for such developments. I focus on methods for the design of data-languages and their corresponding tools. A recurring problem in large software research projects is that even though every partner uses their own version of such languages and tools, the semantic consistency of these different versions still has to be proven. This so–called consistency problem is a pivotal theme in this thesis. A second theme consists of another problem, the so–called adaptation problem, where existing modeling languages are being used to develop a new semantic basis, for instance for visualization and simulation techniques. For this second problem the contribution of this thesis consists of the development of tools for automatic transformation of data–languages; this is how the research for this thesis could contribute to the projects Omega and Archimate that sponsored the research.

As an example the sieve of Eratosthenes is modeled in such a way that the model is as abstract as possible, but still being consistent with the so–called Kernel–model semantics in the Omega project. The consistency is derived from the corresponding tool being executable, such that it yields the desired observable behavior. A second contribution is visualization and the architecture of tools for visualization and simulation. These are developed for business processes, so–called Enterprise Architectures, in the Archimate project, where their architecture is outlined. For this purpose a so–called domain–specific data language is introduced in order to be able to model large software projects. This is further described in the Introduction, chapter 1. The other chapters consist of my publications for these projects.