Graph Transformation as a Modelling Technique

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Abstract A lot of systems lend themselves very naturally to being modelled as (directed, labelled) graphs. Such a representation can give rise to additional insights and analysis techniques, through the principle of graph transformation.

We are interested in an approach where graphs represent the states of a system, and every (discrete) system step is captured by a change to its state graph. That change can be captured by a graph transformation rule; the set of all such rules is then a complete characterisation of the dynamics of the system. By exploring the successive application of rules to an initial graph (describing the initial system state), one can then explore and model check the state space.

In this tutorial presentation we explain the basic principles behind graph transformation, and show its use on a number of examples. A large part will rely upon tool for graph transformation, called GROOVE[1]. The main aim of the tutorial is that, afterwards, those present can decide for themselves whether the technique of graph transformation can help them in their own modelling domain, and make a start in doing so.

Keywords graph transformation, behavioural modelling, state space exploration, model checking

[1] GROOVE available at https://sf.org/projects/groove