Abstract:

Many complex systems today, such as robotic networks, automobiles and automated factories, consist of hard-ware components whose functionality is extended or con-trolled by embedded software and which exhibit contin-uous dynamics. We address the problem of monitoring and control in such systems with a twofold contribution. First, we extend Probabilistic Hierarchical Constraint Au-tomata (PHCA), introduced in previous work as a means to compactly describe uncertain hardware and complex software behavior, to hybrid PHCA (HyPHCA). These al- low to model continuous behavior in the form of differ-ential equations. Continuous behavior can be conserva-tively approximated with discrete Markov chains, and in previous work we showed how to transform PHCA moni-toring into a constraint optimization problem that can be solved using off-the-shelf reasoners. Our second contri-bution is to show how to combine these and additional known methods to use a HyPHCA to monitor the internal state and plan for contingencies in a rich class of mixed hardware/software, discrete/continuous systems. Prelimi-nary results of our approach for an industrial filling sta- tion scenario demonstrate its
feasibility.

Stichworte: hybrid diagnosis, hybrid systems, diagnosis, fault adaptive control; model-based diagnosis


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