Model-based Verification and Analysis for Real-Time Systems

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The lectures will also emphasize the substantial research effort in the design of algorithms and datastructures for efficient analysis of timed automata and its extensions covering important datastructures such as DBMs (diffence bounded matrices) and CDD (clock difference diagrams) as to be found in the verification tool UPPAAL and its various branches.

Model-driven development has been proposed as a way to deal with the increasing complexity of real-time and embedded systems, while reducing the time and cost to market. The use of models should permit early assessment of the functional correctness of a given design as well as requirements for resources (e.g. energy, memory, and bandwidth) and real-time and performance guarantees.

During these lectures we will offer a thorough account of the formalism of timed automata due Alur and Dill as well as several recent extensions. These extensions include priced timed automata, (priced) timed games and most recently stochastic timed automata and we will introduce a number of associated decision problems related to model-checking, refinement checking and optimal scheduling and synthesis. The frontier of decidability will be drawn including pointing out a number of open problems.

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References

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