Towards a Database of Timed Automata

Nicolaj Østerby Jensen[1] and Marius Mikučionis[1]

Aalborg University, Aalborg, Denmark
{noje,marius}@cs.aau.dk

The lack of a standardized, curated collection of benchmark models currently hinders the development and evaluation of verification tools for timed automata. Too often, new methods are only investigated on a few toy examples. In other verification domains, shared model databases and competitions (e.g., the QComp competition [5] for quantitative verification and the Model Checking Contest [12] in the Petri net community) have proven successful in driving tool development, fostering reproducibility, and facilitating rigorous comparisons across tools.

We propose initiating a community effort to establish a public database of timed automata models. Such a resource would support a variety of use cases:

- **Benchmarking**: Evaluation and comparison of tools, implementations, and methods on standard models.
- **Regression testing**: Detection of unintended changes in behavior between versions.
- **Correctness validation**: Cross-check results among different tools and methodologies.

However, several practical and technical considerations must be addressed:

- **Model and query format**: The Uppaal [11] XML format is just one of several formats for storing models and queries, and the community at large may be interested in interchange with other formats and databases too. For example, Modest [9] uses JANI format [4] which includes timed automata and covers many more formalisms, and Compositional Interchange Format (CIF) [1] provides a bridge to tools for hybrid systems like mCRL2 [13] and gPROMS [10].
- **Feature diversity**: Timed automata models may include advanced features and extensions (e.g., committed and urgent locations, code fragments, stopwatches [7], uncontrollable transitions [6], hybrid extensions [3], probabilistic extensions [8]). Precise filtering mechanisms are needed so that users can extract models and queries relevant to their use case.
- **Query dependencies**: Some queries generate strategies that affect the interpretation of other queries [2]. These dependencies must be clearly encoded.
- **Parameterized models**: Models often come in families of varying size. Should the database store multiple reasonable sizes or provide scripts for generating instances?
- **Attribution and provenance**: Proper citation is needed to credit authors and provide context about modeling decisions.
- **Curation**: Sustained effort is required to maintain, review, extend, and cross-link the databases with high-quality models.

This abstract aims to initiate a discussion within the community on how best to structure, build, and maintain a shared database of timed automata models that can serve as a foundation for reproducible research and robust tool development.

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