

Progress Report at July 2008 on the FME Small Project

“Zot, an agile metric temporal logic satisfiability checker”

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I refer here to the work plan provided in the project proposal, which included the following four workpackages:

- WP1: Operational extensions, since Zot originally supported a very limited language to define operational models (i.e., automata), being originally designed to use pure temporal logic descriptions. Expected effort: 2 person-weeks.
- WP2: Logic extensions, to offer the user the ability to express formulae in other logic formalisms besides TRIO and LTL. Expected effort: 2 person-weeks.
- WP3: Tool reengineering, to improve Zot’s performance, and to support other SAT-solvers (such as ZChaff). Expected effort: 1 person-week.
- WP4: Documentation, to improve Zot’s usability by providing a complete manual. Expected effort: 1 person-week.

The project activity has been completed. Concerning WP1, support was added for two operational constructs, called the *and-case* and *or-case*, as they take the form of a conjunction or disjunction of a set of clauses that allow the designer to relate the present and the next system states. These constructs were extensively used in the operational models described in [PMS08a, PMS08b]. The Zot environment was also enriched with linguistic support for a variant of dense-time Timed Automata, presented in [FPR08b].

Regarding WP2 on Logic extensions, support was added for a dense-time variant of Metric Temporal Logic and a verification technique based on discretization was implemented, obtaining results that are promising in terms of performance; the technique was presented in [FPR08a].

About WP3, the Zot interface with SAT-solvers has been completely rewritten to allow for easy extensions. This resulted in the enrichment of the set of SAT-solvers that can be used in connection with Zot: besides the previously available MiniSat, now also zChaff and the multi-threaded MiraXT are available.

The WP4 on documentation has produced a “User’s guide to ZOT”, which provides an overview of the ZOT environment, an installation guide, a description of the supported languages, instructions on the usage of the tool, and an overview of the tool software architecture.

The Zot toolset and the related results and case studies, and documentation can be downloaded from <http://home.dei.polimi.it/pradella/>. The Zot tool environment was presented at the Posters & Research Tools Exhibition of the FM’08 International Symposium on Formal Methods, Turku, Finland, May 26 - 30, 2008.

Future research, which will be funded by resources outside the FME Small Project but will certainly benefit from its results, will focus on the definition of novel encodings of temporal logics especially suited to optimize performance of verification of real-time properties, and on the study of completeness issues for the bounded model- and satisfiability checking supported by Zot.

Bibliography

- [FPR08a] C. A. Furia, M. Pradella, M. Rossi, Automated Verification of Dense-Time MTL Specifications via Discrete-Time Approximation, FM’08: 15th International Symposium on Formal Methods, volume 5014 of LNCS, pages 132-147. Springer-Verlag, 2008.
- [FPR08b] Carlo A. Furia, Matteo Pradella, and Matteo Rossi. Practical Automated Partial Verification of Multi-Paradigm Real-Time Models, accepted for publication at 10th International Conference on Formal Engineering Methods (ICFEM 2008), LNCS ???, 27-31 October 2008
- [PMS08a] M. Pradella, A. Morzenti, P. San Pietro, Refining Real-Time System Specifications through Bounded Model- and Satisfiability-Checking, accepted for publication at ASE2008.
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