

- Diploma / Master Thesis -

Probabilistic Model Checking with Interval Arithmetic

What is it all about?

Model checking of probabilistic systems typically exploits numerical algorithms from mathematics such as iterative methods for solving systems of linear equations or integral equations. The accuracy of probabilistic model checkers thus strongly depends on the numerical accuracy of these algorithms. In fact, it is not hard to come up with example Markov models for which either false negatives or false positives are provided due to round-off errors in the numerical computations. This is highly unsatisfactory. In fact, it would be much more informative to the user if the model checker could provide statements such as “the probability to reach a bad state is certainly between 0.93 and 0.96”. In order to facilitate the generation of such answers, this project aims to exploit [interval arithmetic](#).

What is to be done?

The main goals of this project are:

1. [Develop](#) theory for DTMC and CTMC model checking based on interval arithmetic;
2. [Incorporate](#) interval arithmetic libraries in MRMC;
3. [Experiment](#) with various case studies;
4. [Compare](#) efficiency and accuracy compared to standard model checking;
5. [Analyze](#) the experimental results and come up with improvements.

This project will be partially carried out as an internship at the Centre of Mathematics and Informatics (CWI) in Amsterdam, The Netherlands under the supervision of Dr. Pieter Collins and Dr. Ivan Zapreev.

Requirements

- Programming experience preferably in C and C++
- Basic knowledge of Markov chains and model checking.
- An enthusiastic attitude and dedication to the topic.
- Good english communication skills (both oral and written).

Contact

For additional information, please contact us:

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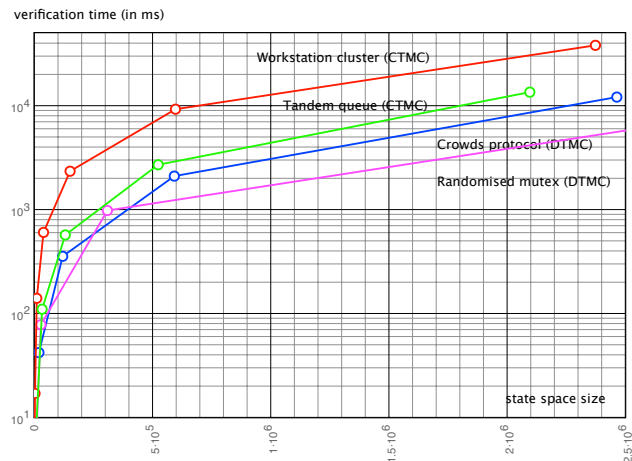


Figure 1: Verification time with “standard” probabilistic model checking

