Ragtimer Artifact

Produced for "Efficient Trace Generation for Rare-Event Analysis in Chemical Reaction Networks" for Verification, Model Checking, and Abstract Interpretation 2023.

Virtual Machine

Download and run the virtual machine as follows:

1. Download at (url)
2. Load virtual machine into preferred VM client. This VM has been tested in KVM on Debian 11.
3. Log in as user `Ragtimer User` with password `ragtimer`
4. Open a terminal. Source code for RAGTIMER is found in the `~/ragtimer` directory.

Running a Ragtimer Test

1. Navigate to the `~/ragtimer/scripts` directory using `cd ~/ragtimer/scripts`. In this folder is a shell script `artifact.sh` which will generate 10,000 traces for the three models mentioned in "Efficient Trace Generation for Rare-Event Analysis in Chemical Reaction Networks". These models are informally described below.
2. Run the shell script via `./artifact.sh`. Results will print directly on the console. If permissions are denied for `artifact.sh`, run `sudo chmod 777 artifact.sh` with sudo password `ragtimer`. Expect results to take several seconds to generate due to the nature of the virtual machine.
3. Expect a printout for each model, with the final line in each printout providing the target's probability. This is indicated by `Total Sum of Unique Path Probabilities`. Because RAGTIMER relies on randomized testing, each execution's probability will be slightly different.
4. If desired, modify the second line of `~/ragtimer/model.ragtimer` to produce an unreachable target state. Using tabs to separate, change `50 2 0 50 0 0 0` to `49 2 0 50 0 0 0`. Because the target state becomes unreachable, Ragtimer will report unreachability.

Note that in the shell script, we use the `loose` command-line argument. This enables loose mode, in which some non-essential reactions are enabled, allowing for the production of a wider array of paths.

Model Descriptions

The following models are tested in this artifact and described in Sections 10.1, 10.2, and 10.3 of "Efficient Trace Generation for Rare-Event Analysis in Chemical Reaction Networks".

1. **Single Species Production-Degredation Model**. In this model, the target involves the production of a single species in two reactions.
2. **Enzymatic Futile Cycle Model**. In this model, the target involves the oscillation between two of six reactions.
3. **Yeast Polarization Model**. In this model, a rare combination of three of eight reactions must fire to reach the target.