Symbolic GameChecker: Probabilistic Analysis

1 Description

Symbolic GameChecker (version for probabilistic analysis) is a prototype tool developed in Java for performing probabilistic analysis of open programs. The tool compiles an open program with infinite integers into a symbolic automaton, which represents the game semantics of the program. The main feature of symbolic automata is that the data is not represented explicitly in it, but symbolically. Along with the tool we have also implemented in Java our own library of classes for working with symbolic automata. The symbolic automata generated by the tool is analyzed to find: safe plays (traces) which correspond to paths that lead to a successful termination of the program without executing the unsafe command *abort* (they do not contain a specified move *abort.run*), and unsafe plays (traces) which correspond to paths that lead to an unsafe behaviour of the program where the unsafe command *abort* is executed (they do contain the specified move *abort.run*). Then an external model counting tool Latte is called to determine the number of solutions (from a bounded integer domain) that satisfy conditions (constraints) associated with the found plays. These counts are then used to assign probabilities to plays (program paths) and to asses the probability for the target event (*abort* is executed or not) to occur at the desired level of confidence.

2 How to Install

2.1 Windows

The tool can be downloaded as a zip file, "symbolicGC-Prob.zip", or a jar file, "symbolicGC-Prob.jar", from the web page. It needs JDK 1.8 version. For "symbolicGC-Prob.zip", unzip it, enter the home directory and run the tool.

java MyParser program*.ia

For "symbolicGC-Prob.jar", enter the home directory and run the tool.

java -jar symbolicGC-Prob.jar program*.ia

The tool takes an program "program*.ia" as input and returns as output "program*-Output.txt" which contains the resulting symbolic automata for "program*.ia" and results from the complete probabilistic analysis.

The tool contains the following call to Latte model counting tool, which can be downloaded from: "https://www.math.ucdavis.edu/ latte/":

"C:/cygwin/bin/bash.exe -c C:/Latte/bin/count.exe Temp"

Thus, make sure that you have installed Latte in the folder "C:/Latte", and cygwin in the folder "C:/cygwin".

2.2 Linux

The tool can be downloaded as a jar file, "symbolicGC-Prob-Linux.jar", from the web page. It needs JDK 1.8 version. Enter the home directory and run the tool.

java -jar symbolicGC-Prob-Linux.jar program*.ia

Make sure that you have installed LATTE and added its bin folder to the PATH variable.

3 Examples

We provide a set of examples, "Examples-SGC-Prob.zip", on which probabilistic analysis was performed. The results from running SYMBOLIC GAMECHECKER (version for probabilistic analysis) is also provided in the same zip file. For example, for the program "program*.ia" the result of probabilistic analysis is given in "program*-Output.txt".