Detecting Runtime Check Patterns and Applying Optimization in GVC0

Sam Estep
Carnegie Mellon University
Pittsburgh, PA, USA
estep@cmu.edu

Paulo Canelas
Carnegie Mellon University
Pittsburgh, PA, USA
pacsantos@cmu.edu

1 PROJECT WEB PAGE:

https://pcanelas.com/optimizing-compilers

2 MAJOR CHANGES

There are no major changes to the project so far.

3 WHAT YOU HAVE ACCOMPLISHED SO FAR

We follow describe the completed described tasks for this milestone:

- ✓ Download and build the GVC0 tool.
- ✓ To allow replication of the results, create a virtual machine or Dockerfile that automates the setup. We created a Dockerfile for this purpose.
- ✓ Get access to the dataset of C0 programs that have already been used to evaluate GVC0, and download all of them from the database. There were four base programs, and from these, a total of ten thousand permutations were derived. These permutations each specify a different subset of the program's verification conditions, to test the impact of the inserted runtime checks as different parts of the program are statically vs dynamically verified.
- ✓ Write the milestone report.
- \- We are currently executing the GVC0 tool on its dataset to gradually verify each of these C0 programs, inserting runtime checks and producing C code.
- ✗ Compile those generated C programs with optimizations enabled, and run them to see which have the highest ratio of runtime compared to the time to run the original programs without runtime checks inserted.
- ✗ Inspect those slowest programs to identify patterns that can be exploited to perform optimizations.
- ✗ Select one of the patterns and implement the optimization by changing GVC0 or creating an LLVM pass, then measure the performance impact of that optimization pass.

4 MEETING YOUR MILESTONE

Due to time constraints with other research projects (e.g., recently submitted to PLDI and upcoming submission to FormaliSE), we failed to meet our milestone goal; we actually did not start working on it until three days ago. However, now that the PLDI deadline has passed, we have much more time to engage with this project, and are drastically ramping up our efforts to get back on track.

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5 SURPRISES

Sam got lucky and was able to run GVC0 locally without issue, but Paulo has so far been unable to run it locally or in the Docker image. Although, after requesting others to test the Docker image, they were successfully able to run it. The problem may be related to the Mac M1 system itself.

6 REVISED SCHEDULE

So far, we are slightly behind schedule. However, no changes are required to the schedule going forward since we took possible delays into account when we wrote up the original schedule; specifically, we already knew the PLDI deadline would be close to this milestone deadline. We are still confident that we'll be able to finish the project in time.

7 RESOURCES NEEDED

There are no extra resources needed.

REFERENCES