Determinacy Race Detector for Promises (Artifact)

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---- **Abstract** ----

Much of the past work on dynamic data-race and determinacy-race detection algorithms for task parallelism has focused on structured parallelism with fork-join constructs and, more recently, with future constructs. This paper addresses the problem of dynamic detection of data-races and determinacy-races in task-parallel programs with promises, which are more general than fork-join constructs and futures.

We have introduced a dynamic data race detector, *DRDP*, to help examine task-parallelism programs with promises. DRDP is designed for the HCLIB parallel programming model and capable of pinpointing data races in a HCLIB program. In this artifact, we provide the race detector implementation and all benchmarks to help reproduce the reported results in the paper.

1 Scope

We release the artifact as a Docker image in which we have installed the DRDP race detector all required third-party software (e.g., Clang/LLVM compiler, HCLIB parallel programming model). Furthermore, we also provide all benchmarks and evaluation scripts in the Docker image to help reproduce the evaluation results reported in the paper.

Specifically, the following evaluation results can be reproduced from the Docker image:

- Table 1 (correctness evaluation results on DataRaceBench),
- Table 2 (DRDP performance and statistics),
- Table 3 (graph traversal order comparison),
- Table 4 (performance comparison for reducing redundant checks),
- Figure 11 (DRDP time overhead).

2   Content

The artifact is a Docker image, which contains:
- the source code of HCLIB (`/opt/hclib`),
- the source of DRDP race detector (`/opt/hclib/race_detector`),
- all benchmarks and evaluation scripts (`/opt/hclib/race_detector_benchmark`),
- an original HCLIB instance which is used to measure each benchmark's baseline performance (`/opt/hclib/hclib-install-orig`),
- a race-detection-enabled HCLIB instance which is used to measure DRDP's precision as well as its impact to the program execution (`/opt/hclib/hclib-install`), and
- a Clang/LLVM 14.0.0 compiler (`/opt/llvm14`).

We also provide a README file for the Docker image. The README file can be accessed through the following link: `https://hub.docker.com/r/lecheny/drdp`.

3   Getting the artifact

The artifact endorsed by the Artifact Evaluation Committee is available free of charge on the Dagstuhl Research Online Publication Server (DROPS). In addition, the Docker image is also available at: `https://hub.docker.com/r/lecheny/drdp`.

4   Tested platforms

We have carried out all evaluations on an AMD workstation which has a 12-core Ryzen9 3900X processor and 128 GB RAM. The workstation runs Ubuntu 18.04.6 LTS. The data race detector and all benchmarks were compiled using Clang/LLVM 14.0.0 at the -O3 optimization level. In addition, we have also tested the Docker image on this AMD workstation.

Minimum requirement: 32 GB RAM. Exception: It may require 400 GB RAM to reproduce the result of benchmark *sparselu* in Table 4. This is the only exception for the memory minimum requirement.

5   License

The artifact is available under the BSD-3-Clause license. [1]

6   MD5 sum of the artifact

a683aa51c2cd00b05cc1b941327713ae

7   Size of the artifact

2.43 GiB

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[1] BSD-3-clause license: `https://choosealicense.com/licenses/bsd-3-clause/`