Introduction to Floating-Point Analysis and Reproducibility

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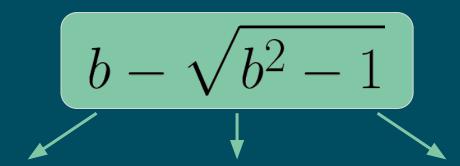


FPCore

Standard Format for FP Analysis Tools

Pavel Panchekha
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The Numeric Design Phase



Herbie

Find accurate formula

FPTaylor

Verify accuracy bounds

C/Fortran/...

Tuning, testing, production

CHALLENGE:

Common format for numerical tools

The FPBench Project

Benchmarks

For tool authors

118 examples

Browsable online

Formats

Common format

Standard metrics

Reference impl's

Tools

Compilers

Transformers

Search tools

Demo

Compose a FPCore program

Apply Herbie

Transform and export to FPTaylor

Export to C code & compile it

The FPCore Format

Easy to parse **common** format

Support for loops, branches, standard functions

Support for complex **mixed-precision** operations

The FPCore Format

```
Arguments
```

Let, while, if, ...

Standard functions

Tools - Exporter

Export to languages (C) & tools (FPTaylor)

racket export.rkt in.fpcore out.c

Customizable through metadata, flags

:precision binary32

Tools - Transformer

Common code transformations for analysis

racket transform.rkt --unroll 3 in.fpcore -

Automate inter-tool communication

tool1 | racket transform.rkt --cse | tool2

You Can Help!

HPC authors: Tool authors:

Submit examples Accept FPCore input/output

File bugs + test exporters Contribute transformations

Looking for tensor kernels Web-accessible tools

Using FPBench

Examples: http://fpbench.org

Github: fpbench/fpbench

racket export.rkt in.fpcore out.c

racket transform.rkt --unroll 3 in.fpcore -