Introduction to Floating-Point Analysis and Reproducibility

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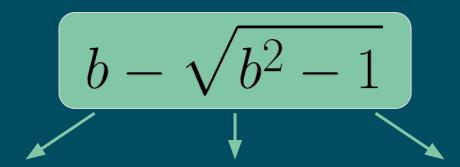


FPCore

Standard Format for FP Analysis Tools

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The Numeric Design Phase



Herbie

Find accurate rearrangement

FPTaylor

Verify accuracy bound

C/Java/...

Add code to production

CHALLENGE:

Common format, semantics, metrics

The FPBench Project

Benchmarks

For tool authors

118 examples

Browsable online

Tools

Compilers

Transformers

Search tools

Standards

Common format

Standard metrics

Reference impl's

Demo

Compose a FPCore program

Apply Herbie

Transform and export to FPTaylor

Export to C code & run it

The FPCore Language

```
Arguments
```

```
(FPCore (x)

:pre (< 1 x 100) Precondition

(let ([discriminant (- (* b b) 1)])
    (- b (sqrt discriminant))))</pre>
```

Let, while, if, ...

Standard functions

The FPCore Language

Easy to parse common format

Support for loops, branches, standard functions

Support for complex mixed-precision operations

Tools - Exporter

Export to languages (C/++) & tools (Sollya)

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 exporters

Using FPBench

Examples: http://fpbench.org

Github: fpbench/fpbench

racket export.rkt in.fpcore out.c

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