Sampling Series Rewrites Regimes

**What the Float?**

Computers approximate real numbers using floating point.

Floats are used everywhere.

Approximation leads to error:

- Quadratic Formula

Error (bits)

Herbie automatically reduces error:

Error (bits)

Find out more about Herbie at:

http://herbie.uwplse.org

**How Herbie Works**

Sample random input points

Localize errors to certain operators

Algebraic rewrites using a rewrite database

Series expansions avoid under/overflow

Infer branches that combine programs

Herbie uses a heuristic search algorithm to find programs that compute the same expression more accurately.

The search works without human input.

**Results**

We’ve tested Herbie on classic problems and real-world formulas from numerical libraries, scientific papers, and even from large-scale surveys of open-source code.

Herbie often finds and fixes inaccuracies.

Try an online demo at our website!

http://herbie.uwplse.org/demo

**Real World Impact**

Fix bugs in a math library

Compiler plugin for GHC Haskell

Pavel Panchekha  
Alex Sanchez-Stern  
James Wilcox  
Zachary Tatlock