Simulation of Rosetta Models

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Rosetta Design Flow

Model

Model

parser

Rosetta Semantic Object Model

Core Libraries

Test Vectors

Refinement Synthesis

simulator

Simulation Trace

e tc…
Simulation Overview

• AIM:
  Generate a trace of variable values from a given starting point.

• Benefits:
  – Relatively cheap cv exhaustive search.
  – Can help gain an intuitive feel for a model.
  – Can highlight incorrect outputs quickly.
Simulation Overview - cont’d

• Problems:
  – Not all domains can be simulated.
  – Not all models are sufficiently constrained to guarantee that a result can be determined.

• Solutions:
  – Generate a suite of inter-operable techniques for simulation rather than rely on a ‘one-size-fits-all’ method.
Structure Of The Simulator

Model

User
Input

Results

simulator

Analyse
Model

values
x = [42, 3, …]
y = [a, z, …]

select technique

iteration

chaining

solver

arithmetic

instantiation

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Simulation of Rosetta Models
Pivoting

• Often the free variable is not explicit:
  eg. $T1: x = f(5, [1,2,3,4,5])$;
  but is defined implicitly:
  eg. $T2: f(x, [1, 4]) = 12$;

• To calculate the value of the free variable we need to *pivot* the expression to an equivalent reducible expression.
Pivoting – cont’d

- Simple example.
- Develop a lattice of function inverses:
  - Arithmetic identities.
  - User-specified pairs.
  - Automatic detection.

\[
p + 5x = p - 5x
\]
Summary

• Many benefits of simulation.
• However not all models, or even all starting points will be traceable.
• Techniques such as *pivoting* will expand the space of ‘useful’ models, and hence the viability of using Rosetta for modelling.