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Type Reconstruction

- Context: program understanding in dynamically typed languages
  - e.g. extraction of class diagrams
- Type Reconstruction
  - input: program without types
  - output: program with types

Trade-offs

- Precision vs. efficiency
  - We chose efficiency for usage in a development browser
  - Use Heuristics as basis for the reconstruction
    - instead of full reconstruction

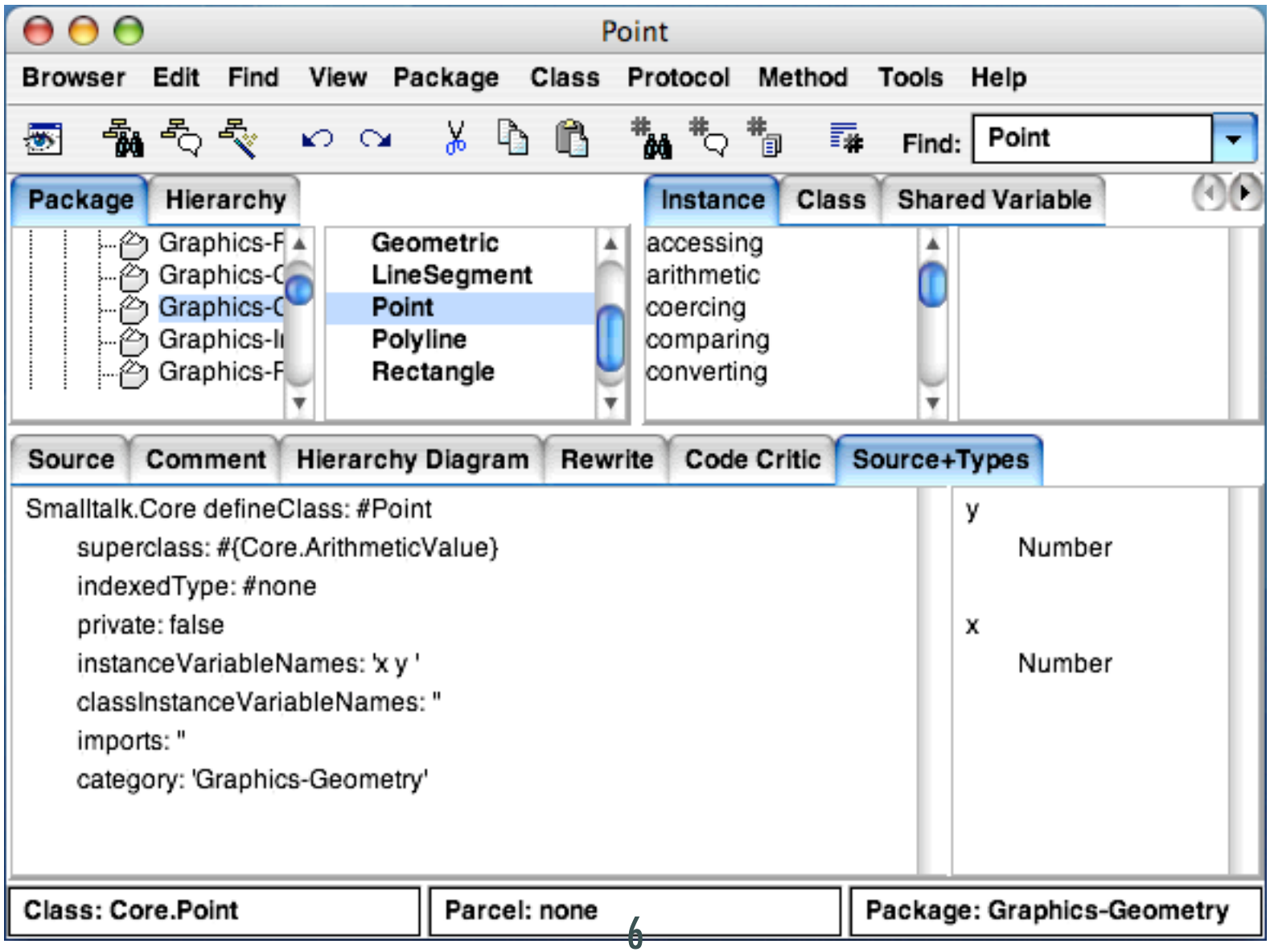
Heuristics

- Direct sends to instance variable
- Indirect sends to instance variables (getter methods)
- Direct assignment expressions
- Indirect assignment expressions (setter methods)
- (Type snooping)

Implementations

- Using LiCoR (Library for Code Reasoning) in SOUL
  - on the parse tree
  - average: 500 milliseconds / instance variable
  - more elaborate and easier to extend
- Using partial evaluation on the byte code
  - average: 30 milliseconds / class

Demo


Point
Browser Edit Find View Package Class Protocol Method Tools Help
Find: Point
Package Hierarchy
Graphics-F
Graphics-G
Graphics-G
Graphics-I
Graphics-F
Geometric
LineSegment
Point
Polyline
Rectangle
Instance Class Shared Variable
accessing
arithmetic
coercing
comparing
converting
Source Comment Hierarchy Diagram Rewrite Code Critic Source+Types
Smalltalk.Core defineClass: #Point
superclass: #{Core.ArithmeticValue}
indexedType: #none
private: false
instanceVariableNames: 'x y '
classInstanceVariableNames: ''
imports: ''
category: 'Graphics-Geometry'
y
Number
x
Number
Class: Core.Point
Parcel: none
Package: Graphics-Geometry

Conclusions & Future Work

- Works
  - *About* 80% of correctness on built-in libraries
  - Better on domain-specific code
- Future Work
  - Fix *About*
  - Will do this on (untyped) Java code and compare results