Type Feedback for Bytecode Interpreters

Position Paper, ICOOOLPS 2007

Michael Haupt, HPI Potsdam Robert Hirschfeld, HPI Potsdam **Marcus Denker**, SCG Bern

Message Lookup

Method call in dynamic object oriented languages:

- 1. Message is send to an object
- 2. The class of the object is searched for a method
- 3. If not found, go to superclass
- 4. Execute the method found or raise exception

Problem: slow

Global Cache

- ◆ <target class, selector> → Method
- Frequent collisions
- Flushed often
 - Any change in the class hierarchy
 - GC

No information per send site

Inline Caching

- Cache per send site class → method
 - Simple Inline Cache: one entry
 - PIC: multiple entries

- Provides type-feedback data
- Only used in VMs with JIT compilers
 - Examples: Self, Strongtalk, some Java VMs

Interpreter PIC

- Why no PIC in Interpreters?
 - Performance?
 - Type feedback data!

Prototype

- Squeak Smalltalk
 - Very simple interpreter
 - Easy to modify
 - Uses global lookup cache

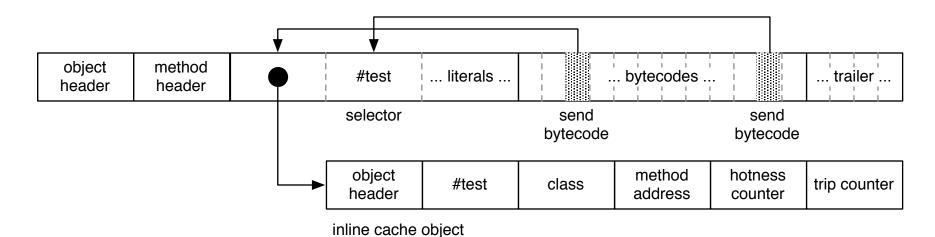
PICs as Objects

 PICs should be objects, not VM level data structures

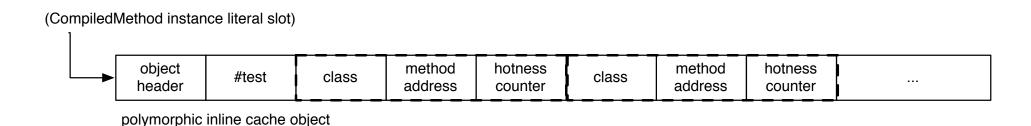
- VM level modification minimized
- All management code implemented in high-level language
- PIC data reflectively accessible

Implementation

Method with Inline Cache



PIC



Status

- Image side code for PIC implemented
 - Compiler / method layout modifications
- First virtual machine experiments

Future: use dynamic feedback for optimizations (AOStA)

Conclusion

- Experiment with PICs in the Interpreter
- PICs as Objects
- Implement as much as possible outside the VM

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Feedback?