CSE 341: Programming Languages

Spring 2006
Lecture 23 — Introduction to Smalltalk
Today

Why Smalltalk?

Some basics of smalltalk programs

- Syntax
- Messages
- Blocks
- Classes and Methods
- Dynamic Dispatch
- self and super

Section: The Squeak environment (projects, saving your work, etc.)
Smalltalk

• Pure object-oriented
• Class-based
• Dynamically typed

A good starting point for discussing what each of these means and what other languages look like.

The language has been quite stable since 1980.

Other points:

• A tiny language; easy to learn almost all of it
• A complete commitment to dynamic changes; little abstraction support
Overview of Smalltalk

1. All values are *objects*
   - Even numbers, code, and classes

2. Objects communicate via *messages* (handled by methods)

3. Objects have their own state

4. Every object is an instance of a class

5. A class provides behavior for its instances

This sounds a lot like Java, but smaller.

It’s also much more like Scheme than it seems; we’ll return to “what really makes something OO”

But first we need to get “the feel for Smalltalk”
An Example

| anArray anIndex aValue |

aValue := 2.
anArray := Array new:10.
1 to: 10 do:
    [:index | anArray at: index put: (aValue * index)].
anIndex := 1.
[anIndex <= anArray size]
    whileTrue:
        [Transcript show:
            'Value at: ', (anIndex printString), ' is ',
            (anArray at: anIndex) printString; cr.
anIndex := anIndex+1.|
Syntax

exp ::= atom | assign
    | unarySend | infixSend | keywordSend
    | ( exp ) | exp . exp | ^ exp

atom ::= ID | literal | block
literal ::= INTEGER | STRING | ...
block ::= [:ID1 ... :IDn | exp] | [ exp ]

assign ::= name := exp | name _ exp

unarySend ::= exp ID
infixSend ::= exp OPERATOR exp
keywordSend ::= exp ID1: exp ... IDn: exp
Some key ideas

• Really, everything is an object
• Blocks are lambdas
• Return (↑) is special
• Everything is “dynamic” – evaluation can add/remove classes, add/remove methods, etc.
• Dynamic typing
• Dynamic dispatch
• Sends to self (a special identifier; Java’s this)
Protection?

- Fields are inaccessible outside of instance
- All classes and methods are available to everyone
- No namespace management; category has no semantic significance