SMA:
Software Modeling and Analysis

Practical Session

Week 03

Assignment 02

Discussion

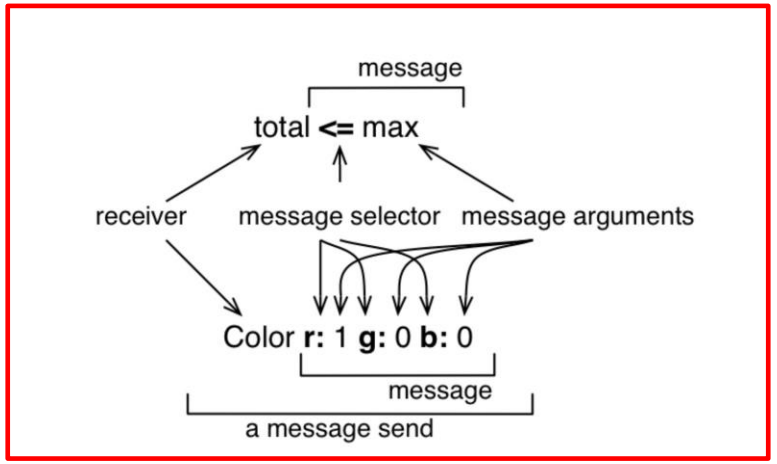
A02 - Exercise 01

Nature of Smalltalk and GT

a) Which threat arises when you develop in a live system?

Execution of random code might alter the execution environment and introduce future problems.

b) What is a message in Smalltalk?



A02 - Exercise 01

Nature of Smalltalk and GT

c) What is a block in Smalltalk?

Lambda-expression-like construct that defines an anonymous function. Blocks may take one or more arguments and can have local variables.

Their syntax is: ([:i :j :k | ...])

d) How do Smalltalk, Pharo and GT relate to each other?

Smalltalk is the programming language used in Pharo and GT. Pharo is (mostly) implemented in Smalltalk. GT is a sophisticated framework written in Smalltalk on top of Pharo that uses a headless VM.

A02 - Exercise 01

Nature of Smalltalk and GT

e) What are counterparts of GT tools in your favorite development environment?

Playground	a sophisticated shell with inspection capabilities
Coder	an integrated development environment (IDE)
Git	a Git client
Monitor	resource viewer / task-manager
ExamplesExplorer	(offline) help resources
Transcript	debug or console output window
Morphic World	the base Pharo windowing system and IDE
Spotter	a search that inspects names and file content

A02 - Exercise 02

Object inspection

a) What is the difference between a String and a Symbol in Smalltalk?

Why is it important?

Symbols are immutable and unique. Strings are mutable and not unique. Because Symbols are immutable, they should never be used when their value has to change over time.

A02 - Exercise 02

```
int scoreOfPlayerA, scoreOfPlayerB;
if(scoreOfPlayerA > scoreOfPlayerB)
    print "Player A Won"
else if(scoreOfPlayerA < scoreOfPlayerB)
    print "Player B Won";
else
    print "Match is declared as draw";
```

Object inspection

b) Implement provided pseudo code in Smalltalk.

```
[ :scoreOfPlayerA :scoreOfPlayerB | (scoreOfPlayerA > scoreOfPlayerB)
        ifTrue:[   Transcript show:'Player A won';cr.    ]
        ifFalse:[  (scoreOfPlayerA < scoreOfPlayerB)
                ifTrue:[
                        Transcript show:'Player B won';cr.]
                        ifFalse:[
                                Transcript show:'Match is declared as draw';cr.
                        ]
                ]
] value:38 value:44.
```

A02 - Exercise 02

c) **`includes: anObject`**

How many classes in GT implement the message above?

How many messages in GT use that particular message?

We found 60 classes that implement that message, and more than four thousand messages that use it (e.g., 4 531 in the current Apple macOS GT build).

d) Which message in GT can be sent to a class to find all its subclasses?

`subclasses`

A02 - Exercise 03

CallGraph

Find the top ten most frequently invoked methods in the provided CallGraph representation.

```
Code:
cg := CallGraph fromFile: 'Calls.txt'.
result := (cg methods sorted: [ :a :b | a calls size >= b calls size]).
```

Result:
org.clapper.util.misc.LRUMap$LRULinkedList.addToHead
org.clapper.util.misc.FileHashMap.checkValidity
org.clapper.util.misc.MultiIterator.checkIterator
org.clapper.util.misc.LRUMap.doPut
org.clapper.util.misc.LRUMap.clearTo
org.clapper.util.misc.LRUMap$LRULinkedListEntry.setKeyValue
org.clapper.util.text.AbstractVariableSubstituter.legalVariableCharacter
org.clapper.util.misc.MultiValueMap.keySet
org.clapper.util.misc.MultiValueMap.put
org.clapper.util.misc.FileHashMap$ValuesFile.getFile

Assignment 03

Preview

A03 - Exercise 01

Metamodels (2.5 pts)

i) What is a metamodel?

ii) How are metamodels used in Pharo?

iii) What are responsibilities of a metaclass in Pharo?

iv) Where is `ProtoObject` located in Pharo's class hierarchy?

v) What is the purpose of the class `ProtoObject`?

A03 - Exercise 02

Sub and super classes (3 pts)

(you have to provide your code snippet and the result)

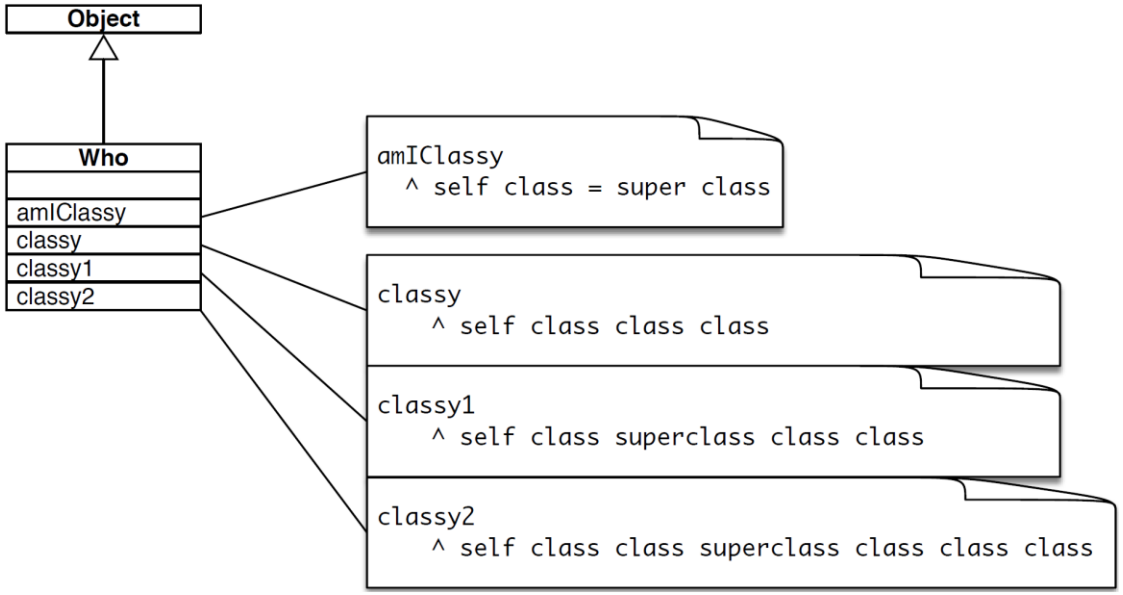
i) How many superclasses does `Collection` have?

ii) How many direct subclasses does `Collection` have?

iii) How many indirect subclasses does `Collection` have?

A03 - Exercise 03

Class identity (3 pts)



a) `Who new amIClassy.`

b) `Who new classy = Who new classy1.`

c) `Who new classy1 = Who new classy2.`

A03 - Exercise 04

Object instantiation (1.5 pts)

i) Where is `new` defined?

ii) Explain Pharo's message implementation resolution strategy for the `new` message.

iii) List the concrete code in GT finally executed by the message `new`.