

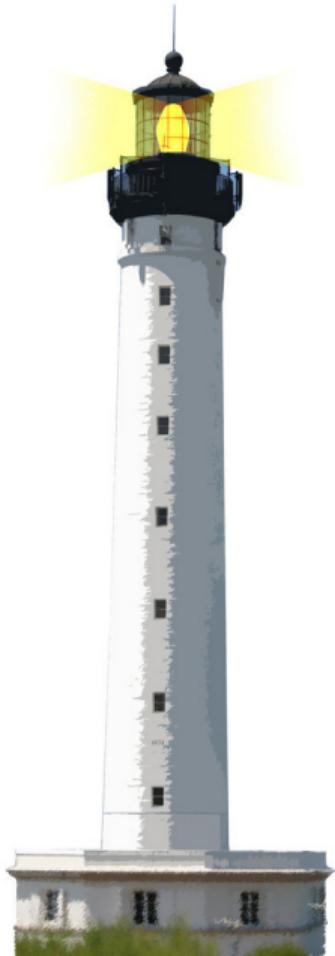
Understanding Messages

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W2S01



<http://www.pharo.org>



Objects, Messages and Closures

- We only manipulate **objects** (mouse, booleans, arrays, numbers, strings, ...)
- We only send them **messages** (@, +, not, getPng:, ifTrue:ifFalse:, new, ...)
- and we use **closures**



Syntax

- Originally invented for kids
- Programs look like little sentences
- Try to minimize the number of parentheses



Example

```
(ZnEasy getPng: 'http://a.tile.openstreetmap.org/8/12/8.png')  
asMorph openInWindow
```



Three Kinds of Messages to Minimize Parentheses

- **Unary message:** receiver selector
 - 9 squared, Date today
- **Binary message:** receiver selector argument
 - 1+2
 - 3@4
- **Keyword message:** receiver key1: arg1 key2: arg2
 - 2 between: 10 and: 20



Message Precedence

(Msg) > Unary > Binary > Keywords

- First we execute ()
- Then unary, then binary and finally keyword messages

This order minimizes () needs

But let us start with messages



Unary Message Examples

anObject aSelector

1 class
> SmallInteger

false not
> true

Date today
> 24 May 2009

Float pi
> 3.141592653589793



Did you notice?

- We sent messages to any objects, including classes!
- There is no difference between sending a message to an object or to a class

1 class

> [SmallInteger](#)

[Date](#) today

> 27 June 2015



A Bit of Introspection

Point selectors

```
> #(#x #theta #quadrantOf: #onLineFrom:to:within:  
    #bitShiftPoint: #< #scaleFrom:to: #sideOf: #'\\' #scaleTo:  
    #grid: #'//' #asIntegerPoint #directionToLineFrom:to: ...)
```

- Returns all the messages the class understands



A Little Query

- Let us query the system and only filter the unary messages:

Point selectors select: #isUnary

```
> #(#x #theta #asIntegerPoint #r #negated #normalized #sign  
#degrees #isIntegerPoint #guarded #fourNeighbors  
#eightNeighbors #min #max #ceiling #normal #asPoint #y  
#abs #isPoint #angle #transposed #reciprocal  
#asFloatPoint #asNonFractionalPoint #rounded  
#leftRotated #floor #truncated #hash #deepCopy  
#fourDirections #rightRotated #isSelfEvaluating #asMargin  
#isZero)
```

- select: is an iterator (see Iterator lecture)
- Easy :-)



Binary Messages

anObject aBinarySelector anArgument

- Used for arithmetic, comparison and logical operations
- One, two or three characters taken from:
 - + - / \ * ~ < > = @ % | & ! ? ,



Binary Message Examples

```
1 + 2  
> 3
```

```
2 > 3  
> false
```

```
10@200  
> 10@200
```

```
'Black chocolate' , ' is good'  
> 'Black chocolate is good'
```



Keyword Messages

```
anObject keyword1: arg1 keyword2: arg2
```

equivalent to:

```
receiver.keyword1keyword2(arg1, arg2)
```



Test Yourself!

- 1 log
- Browser open
- 2 raisedTo: 5
- 'hello', 'world'
- 10@20
- point1 x
- point1 distanceFrom: point2



Test Yourself!

- 1 log (unary)
- Browser open (unary)
- 2 raisedTo: 5 (keyword)
- 'hello', 'world' (binary)
- 10@20 (binary)
- point1 x (unary)
- point1 distanceFrom: point2 (keyword)



Example: Message setX:

```
10@20 setX: 2  
> 2@20
```

- We change the x value of the receiver (a point)
- No parentheses required



Example: Message at:put:

```
#('Calvin' 'hates' 'Suzie') at: 2 put: 'loves'  
> #('Calvin' 'loves' 'Suzie')
```

- #(...) creates an array
- at:put: changes the value of the array element.
- arrays start at 1 in Pharo (i.e., first element is at index 1)



Example: Message between:and:

```
12 between: 10 and: 20
```

```
> true
```

- The message between:and: is sent to an integer
- Takes two arguments 10 and 20



Summary

Three kinds of messages: unary, binary and keywords

- Unary
 - 5 factorial
- Binary
 - $2 + 3$
- Keywords-based messages
 - 2 between: 0 and: 10



A course by



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Inria 2020

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