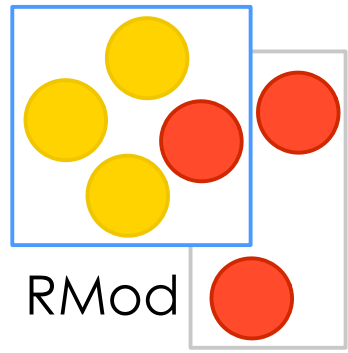


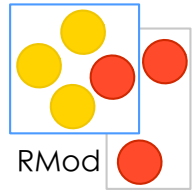
A Little Journey in the Smalltalk Syntax

Stéphane Ducasse
stephane.ducasse@inria.fr
http://stephane.ducasse.free.fr/

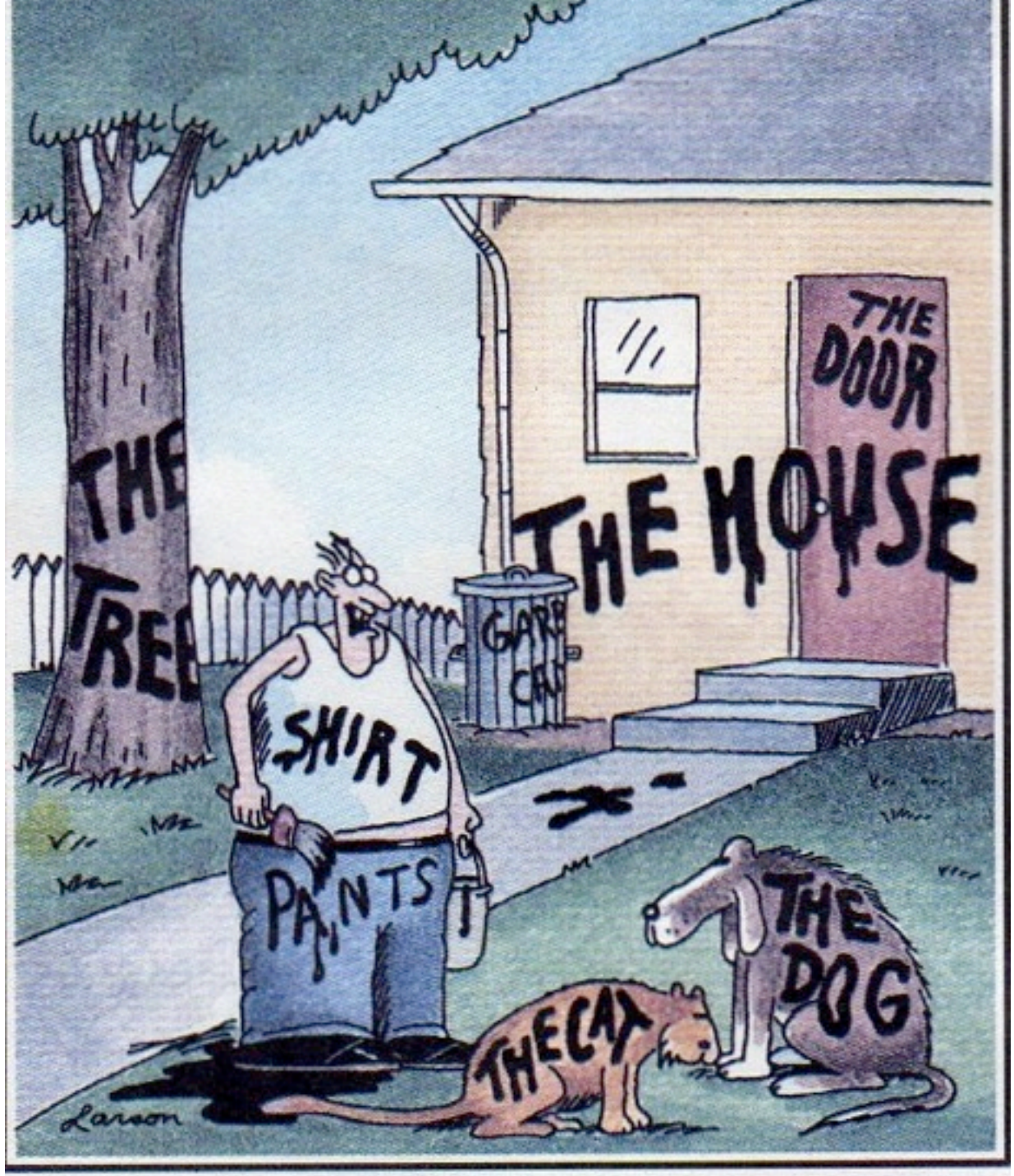
Goal

Lower your stress :)

Show you that this is simple

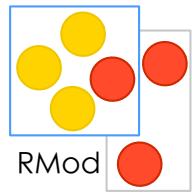


Appetizer!



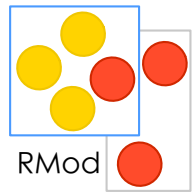
"Now! ... *That* should clear up
a few things around here!"

RMod



Yeah!

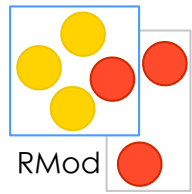
Smalltalk is a dynamically typed language




```
ArrayList<String> strings
                = new ArrayList<String>();
```

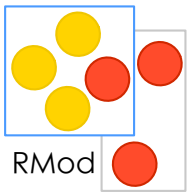
strings := ArrayList new.

Shorter




```
Thread regThread = new Thread(
   new Runnable() {
     public void run() {
            this.doSomething();}
            });
regThread.start();
```

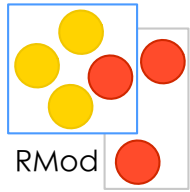
[self doSomething] fork.



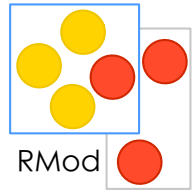
Smalltalk = Objects + Messages + (...)

Roadmap

Fun with numbers

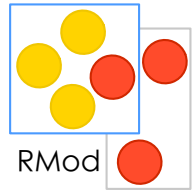


1 class

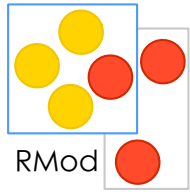


1 class

>SmallInteger

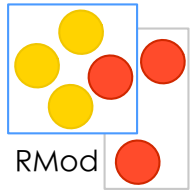


1 class maxVal

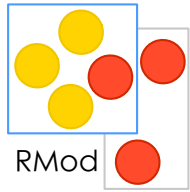


1 class maxVal

>1073741823

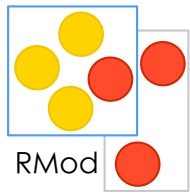


1 class maxVal + 1

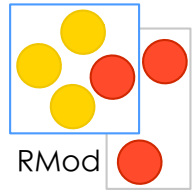


1 class maxVal + 1

>1073741824

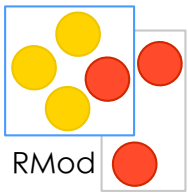


(1 class maxVal + 1) class

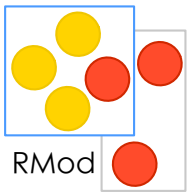


(1 class maxVal + 1) class

>LargePositiveInteger

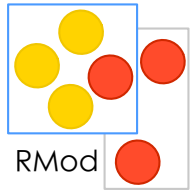


(1/3) + (2/3)

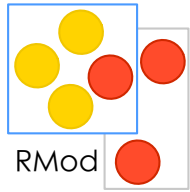


(1/3) + (2/3)

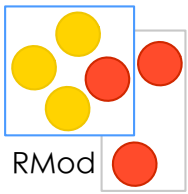
>1



2/3 + 1



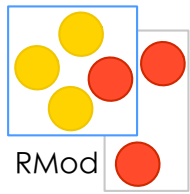

```
2/3 + 1
> 5/3
```



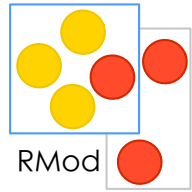
1000 factorial

1000 factorial

4023872600770937735437024339230039857193748642107146325437999104299385123986290205920442084869694048004799
8861019719605863166687299480855890132382966994459099742450408707375991882362772718873251977950595099527612
0874975462497043601418278094646496291056393887437886487337119181045825783647849977012476632889835955735432
5131853239584630755574091142624174743493475534286465766116677973966688202912073791438537195882498081268678
3837455973174613608537953452422158659320192809087829730843139284440328123155861103697680135730421616874760
9675871348312025478589320767169132448426236131412508780208000261683151027341827977704784635868170164365024
1536913982812648102130927612448963599287051149649754199093422215668325720808213331861168115536158365469840
4670897560290095053761647584772842188967964624494516076535340819890138544248798495995331910172335555660213
9450399736280750137837615307127761926849034352625200015888535147331611702103968175921510907788019393178114
1945452572238655414610628921879602238389714760885062768629671466746975629112340824392081601537808898939645
1826324367161676217916890977991190375403127462228998800519544441428201218736174599264295658174662830295557
0299024324153181617210465832036786906117260158783520751516284225540265170483304226143974286933061690897968
4825901254583271682264580665267699586526822728070757813918581788896522081643483448259932660433676601769996
1283186078838615027946595513115655203609398818061213855860030143569452722420634463179746059468257310379008
4024432438465657245014402821885252470935190620929023136493273497565513958720559654228749774011413346962715
4228458623773875382304838656889764619273838149001407673104466402598994902222217659043399018860185665264850
6179970235619389701786004081188972991831102117122984590164192106888438712185564612496079872290851929681937
2388642614839657382291123125024186649353143970137428531926649875337218940694281434118520158014123344828015
0513996942901534830776445690990731524332782882698646027898643211390835062170950025973898635542771967428222
4875758676575234422020757363056949882508796892816275384886339690995982628095612145099487170124451646126037
9029309120889086942028510640182154399457156805941872748998094254742173582401063677404595741785160829230135
3580818400969963725242305608559037006242712434169090041536901059339838357779394109700277534720000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000

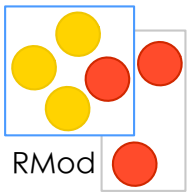


1000 factorial / 999 factorial

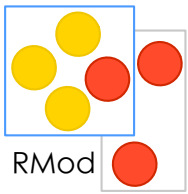


1000 factorial / 999 factorial

> 1000

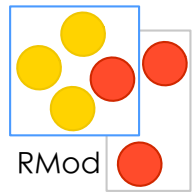


10 @ 100



10 @ 100

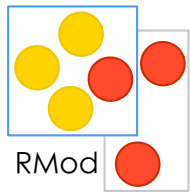
(10 @ 100) x



10 @ 100

(10 @ 100) x

> 10

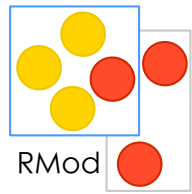


10 @ 100

(10 @ 100) x

> 10

(10 @ 100) y



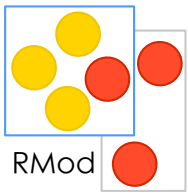
10 @ 100

(10 @ 100) x

> 10

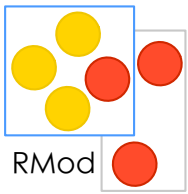
(10 @ 100) y

>100



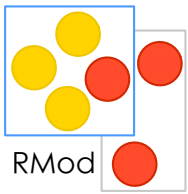
Points!

Points are created using @



Puzzle

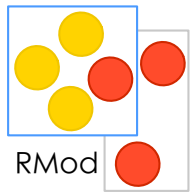
(10@100) + (20@100)



Puzzle

(10@100) + (20@100)

>30@200



Puzzle

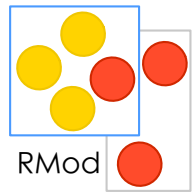
(10@100) + (20@100)

>30@200

Roadmap

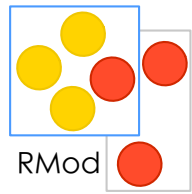
Fun with characters, strings, arrays

$C $h $a $r $a $c $t $e $r



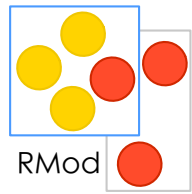
$F $Q $U $E $N $T $i $N

space? tab?



Character space
Character tab
Character cr

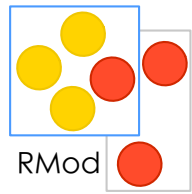
'Strings'



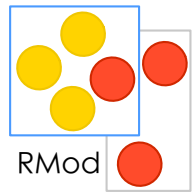
'Tiramisu'

Characters

```
12 printString

> '12'
```

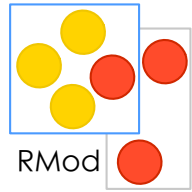


Strings are collections of chars



'Tiramisu' at: 1

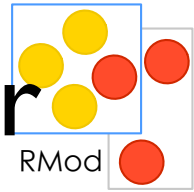
Strings are collections of chars



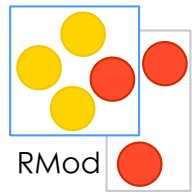
'Tiramisu' at: 1

> $T

A program — Finding the last character

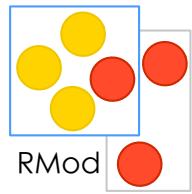


A program!




```
| str |
```

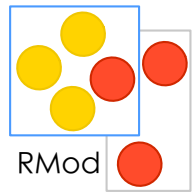
A program!




```
| str |
```

local variable

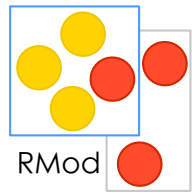
A program!




```
| str |
str := 'Tiramisu'.
```

local variable

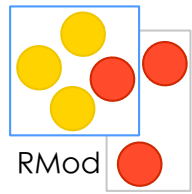
A program!




```
| str |
str := 'Tiramisu'.
```

local variable assignment

A program!




```
| str |
str := 'Tiramisu'.
str at: str size
```

local variable

assignment

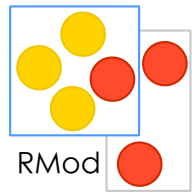
A program!

```
| str |
str := 'Tiramisu'.
str at: str size
```

local variable
assignment
message send

```
> $u
```

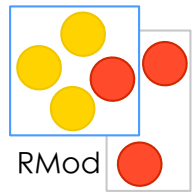
double ' to get one



'L''Idiot'

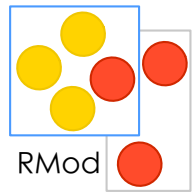
> one string, containing a single apostrophe

For concatenation use ,



'Calvin' , ' & ', 'Hobbes'

For concatenation use ,

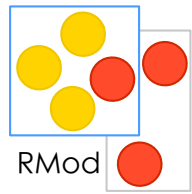



```
'Calvin' , ' & ', 'Hobbes'
  > 'Clavin & Hobbes'
```

For concatenation use ,

'Calvin' , ' & ', 'Hobbes'
> 'Calvin & Hobbes'

Symbols: #Pharo



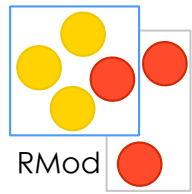
#Something is a symbol

Symbol is a unique string in the system

#Something == #Something

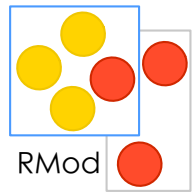
> true

“Comment”



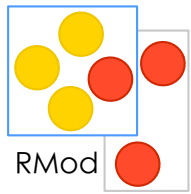
“what a fun language lecture.
I really liked the desserts”

#(Array)



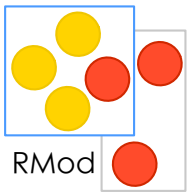
#('Calvin' 'hates' 'Suzie')

#(Array)



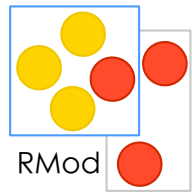

```
#('Calvin' 'hates' 'Suzie') size
```

#(Array)



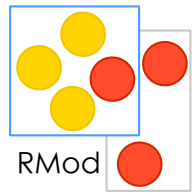

```
#('Calvin' 'hates' 'Suzie') size
  > 3
```

First element starts at 1



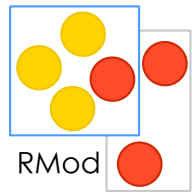
#('Calvin' 'hates' 'Suzie') at: 2

First element starts at 1




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

at: to access, at:put: to set




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

#(Array)

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

> #('Calvin' 'loves' 'Suzie')

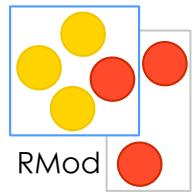
Syntax Summary

comment:	"a comment"
character:	$c $h $a $r $a $c $t $e $r $s $# $@
string:	'a nice string' 'lulu' 'l''idiot'
symbol:	#mac #+
array:	#(1 2 3 (1 3) $a 4)
byte array:	#[1 2 3]
integer:	1 2r101
real:	1.5 6.03e-34 4.0 2.4e7
fraction:	1/33
boolean:	true false
point:	10@120

Roadmap

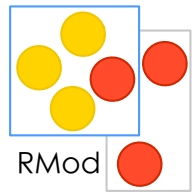
Fun with keywords-based messages

Keyword-based messages




```
arr at: 2 put: 'loves'
```

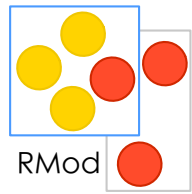
Keyword-based messages



arr **at:** 2 **put:** 'loves'

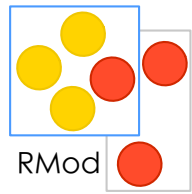
somehow like arr.atput(2,'loves')

From Java to Smalltalk



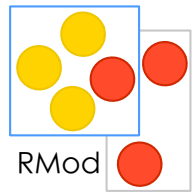
postman.send(mail,recipient);

Removing



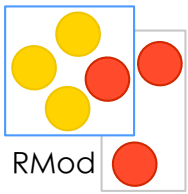

```
postman.send(mail,recipient);
```

Removing unnecessary

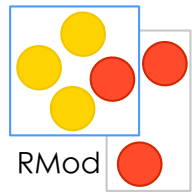


postman send mail recipient

But without losing information



postman send mail to recipient



postman send: mail to: recipient

```
postman.send(mail,recipient);
```

postman send: mail to: recipient

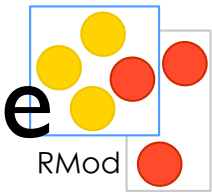
```
postman.send(mail,recipient);
```

The message is send:to:

Roadmap

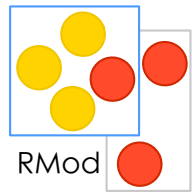
Fun with variables

Shared or Global starts with Uppercase



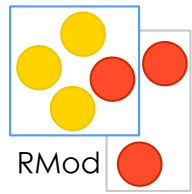

```
Transcript cr .
Transcript show: 'hello world'.
Transcript cr .
```

local or temps starts with lowercase




```
| str |
str := 'Tiramisu'
```

self, super, true, false, nil

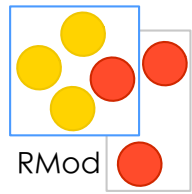


self = this
super

true, false are for Booleans

nil is UndefinedObject instance

self, super, true, false, nil



self = this in Java
super

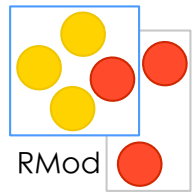
true, false are for Booleans

nil is UndefinedObject instance

Roadmap

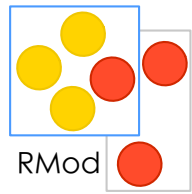
Fun with classes

A class definition!




```
Superclass subclass: #Class
        instanceVariableNames: 'a b c'
    ...
        category: 'Package name'
```

A class definition!




```
Object subclass: #Point
        instanceVariableNames: 'x y'
        classVariableNames: ''
        poolDictionaries: ''
        category: 'Graphics-Primitives'
```

A class definition!

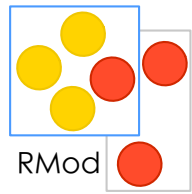
RMod

```
Object subclass: #Point
        instanceVariableNames: 'x y'
        classVariableNames: ''
        poolDictionaries: ''
        category: 'Graphics-Primitives'
```

Roadmap

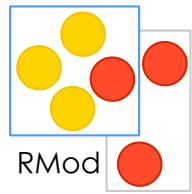
Fun with methods

On Integer




```
asComplex
        "Answer a Complex number that represents value of
        the the receiver."

        ^ Complex real: self imaginary: 0
```

On Boolean

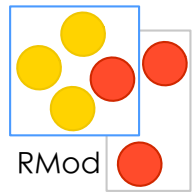


xor: ***aBoolean***

"Exclusive OR. Answer true if the receiver is not equivalent to aBoolean."

^(self == ***aBoolean***) not

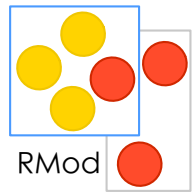
Summary



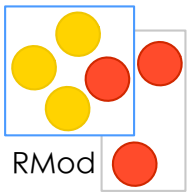
self, super
can access instance variables
can define local variable | ... |
Do not need to define argument types
^ to return

Roadmap

Fun with unary messages

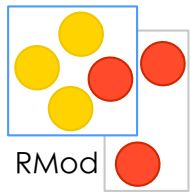


1 class

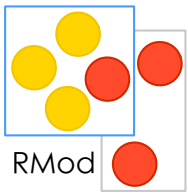


1 class

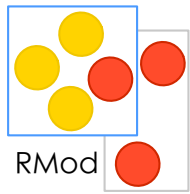
> SmallInteger



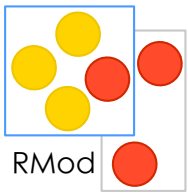
false not



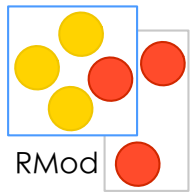

```
false not
> true
```



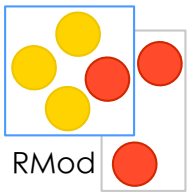
Date today



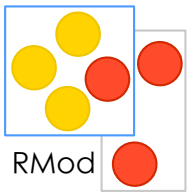
Date today
> 24 May 2009



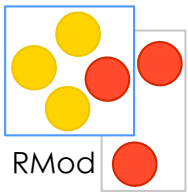
Time now



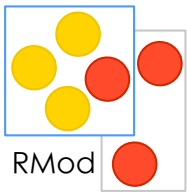
Time now
> 6:50:03 pm



Float pi



Float pi
> 3.141592653589793



We send messages to both objects and to classes!

1 class

Date today

We sent messages to objects or classes!

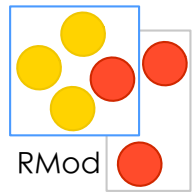
1 class

Date today

Roadmap

Fun with binary messages

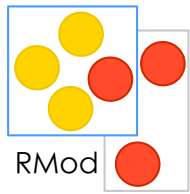
aReceiver aSelector anArgument



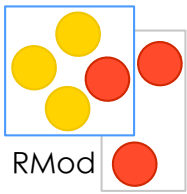
Used for arithmetic, comparison and logical operations

One or two characters taken from:

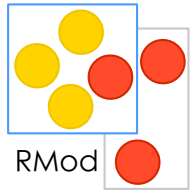
+ - / \ * ~ < > = @ % | & ! ? ,



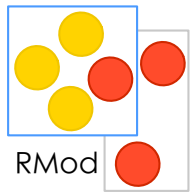
1 + 2



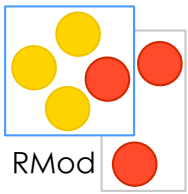

```
1 + 2
>3
```



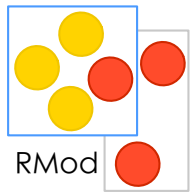
2 => 3




```
2 => 3
> false
```



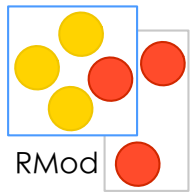
10 @ 200



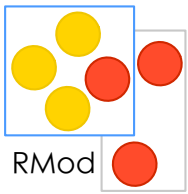
'Black chocolate' , ' is good'

Roadmap

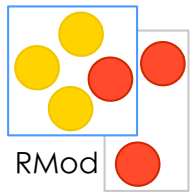
Fun with keyword-based messages



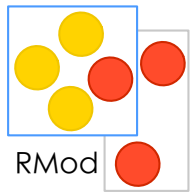
#('Calvin' 'hates' 'Suzie') at: 2 put: 'loves'



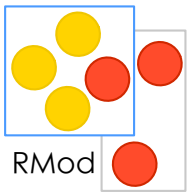
#('Calvin' 'hates' 'Suzie') at: 2 put: 'loves'
> #('Calvin' 'loves' 'Suzie')



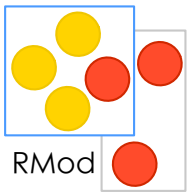
10@20 setX: 2



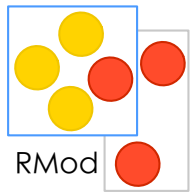

```
10@20 setX: 2
> 2@20
```




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

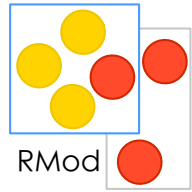



```
12 between: 10 and: 20
> true
```



receiver
keyword1: argument1
keyword2: argument2

equivalent to
receiver.keyword1keyword2(argument1, argument2)

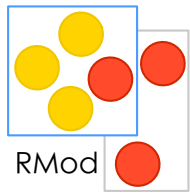


receiver
keyword1: argument1
keyword2: argument2

equivalent to
receiver.keyword1keyword2(argument1, argument2)

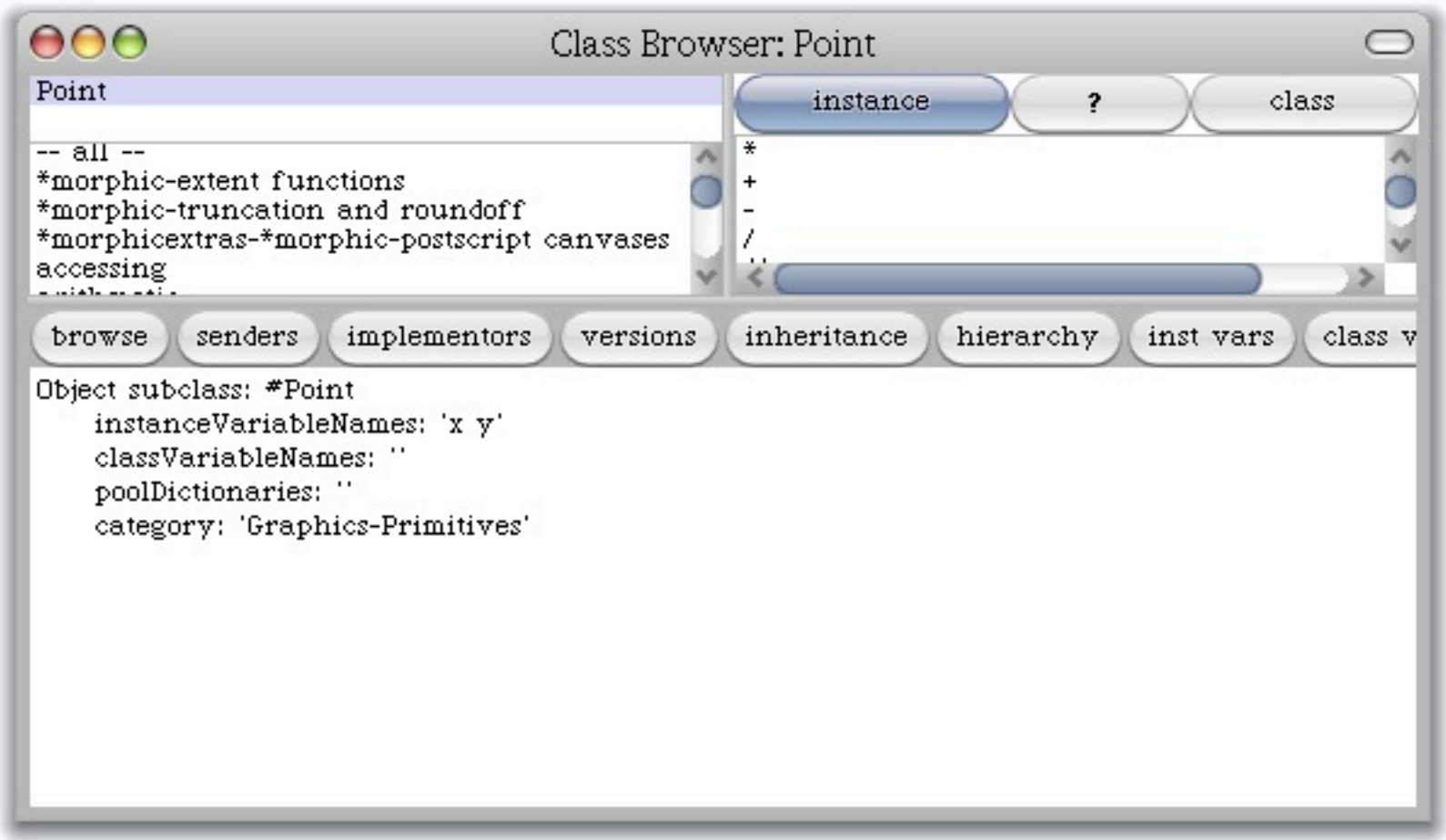
Roadmap

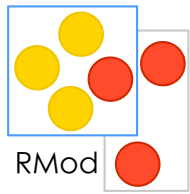
Browser newOnClass: Point



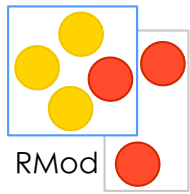
Browser newOnClass: Point

Browser newOnClass: Point





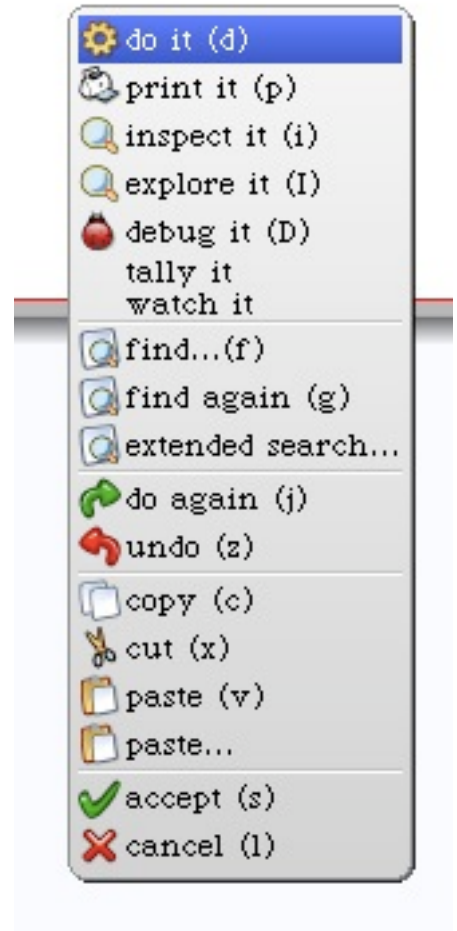
Yes there is a difference between
doing (side effect)
and returning an object

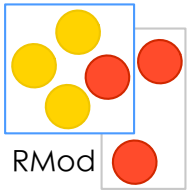


Browser newOnClass: Point
> a Browser

Doing when you do not care about the answer:

Browser newOnClass: Point

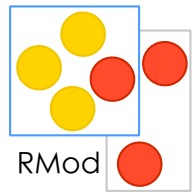




Doing when you really want to see the answer:

10@20 setX: 2
> 2@20

This is called *printing*



dolt (do some Smalltalk code)

vs

printIt (dolt + printing the answer)

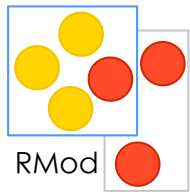
dolt (do some Smalltalk code)

vs

printIt (dolt + printing the answer)

Roadmap

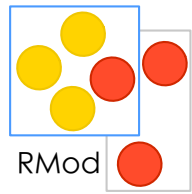
Messages messages
messages
again messages
....



Yes, there are only messages

- unary
- binary
- keywords

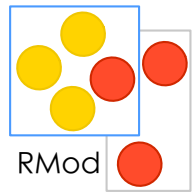
Composition: from left to right!



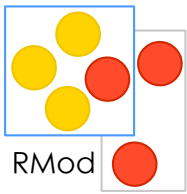

```
69 class inspect
```

```
69 class superclass superclass inspect
```

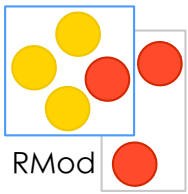
Precedence



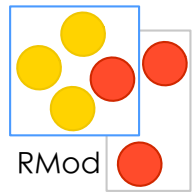
Unary> Binary> Keywords



2 + 3 squared



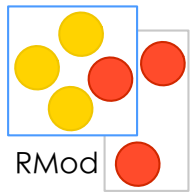
2 + 3 squared
> 2 + 9



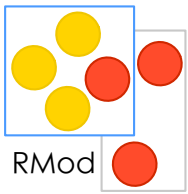
2 + 3 squared

> 2 + 9

> 11

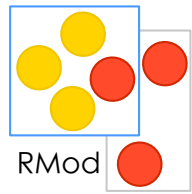


Color gray - Color white = Color black



Color gray - Color white = Color black

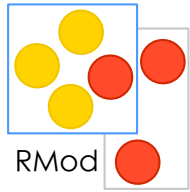
> aColor = Color black



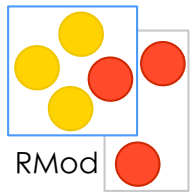
Color gray - Color white = Color black

> aColor = Color black

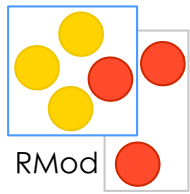
> true



2 raisedTo: 3 + 2

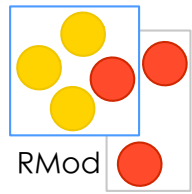



```
2 raisedTo: 3 + 2
> 2 raisedTo: 5
```



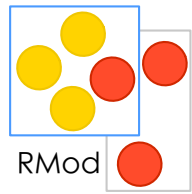

```
2 raisedTo: 3 + 2
> 2 raisedTo: 5
> 32
```

No mathematical precedence



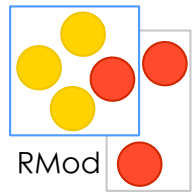
1/3 + 2/3

No mathematical precedence

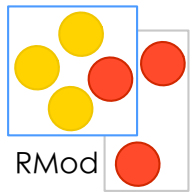



```
1/3 + 2/3
>7/3 /3
```

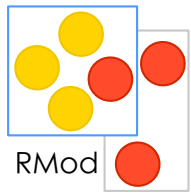
(Msg) > Unary> Binary> Keywords



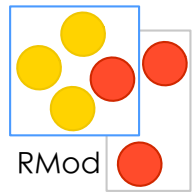
Parenthesized takes precedence!



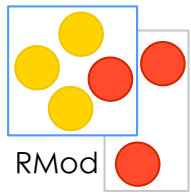
(0@0 extent: 100@100) bottomRight



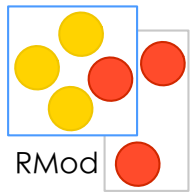

```
(0@0 extent: 100@100) bottomRight
> (aPoint extent: anotherPoint)
bottomRight
```



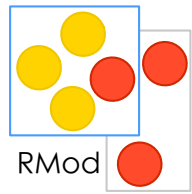

```
(0@0 extent: 100@100) bottomRight
> (aPoint extent: anotherPoint)
bottomRight
> aRectangle bottomRight
```




```
(0@0 extent: 100@100) bottomRight
> (aPoint extent: anotherPoint)
bottomRight
> aRectangle bottomRight
> 100@100
```

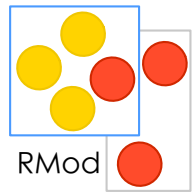


0@0 extent: 100@100 bottomRight



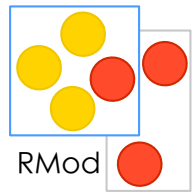

```
0@0 extent: 100@100 bottomRight
> Message not understood
> 100 does not understand bottomRight
```

No mathematical precedence



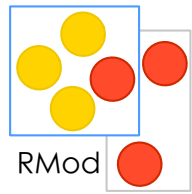

```
3 + 2 * 10
```

No mathematical precedence



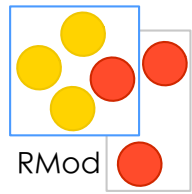

```
3 + 2 * 10
> 5 * 10
```

No mathematical precedence



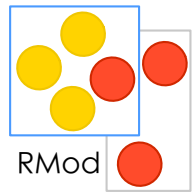

```
3 + 2 * 10
> 5 * 10
> 50
argh!
```

No mathematical precedence



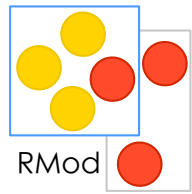
3 + (2 * 10)

No mathematical precedence



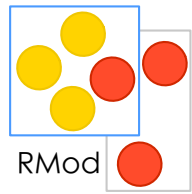

```
3 + (2 * 10)
> 3 + 20
```

No mathematical precedence



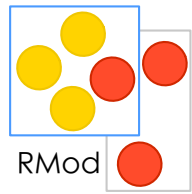

```
3 + (2 * 10)
> 3 + 20
> 23
```

No mathematical precedence



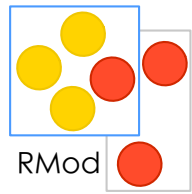

```
1/3 + 2/3
> 7/3 /3
```

No mathematical precedence



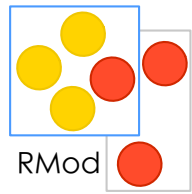
1/3 + 2/3
> (7/3) /3
> 7/9

No mathematical precedence



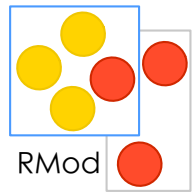
(1/3) + (2/3)

No mathematical precedence



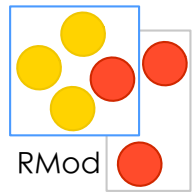
(1/3) + (2/3)
> 1

Only Messages



(Msg) > Unary > Binary > Keywords
from left to right
No mathematical precedence

Only Messages

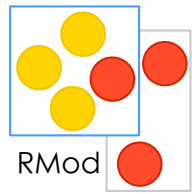


(Msg) > Unary > Binary > Keywords
from left to right
No mathematical precedence

Roadmap

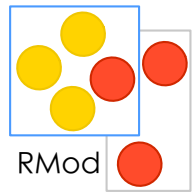
Fun with blocks

Function definition



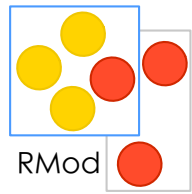

```
fct(x) = x * x + x
```

Function Application



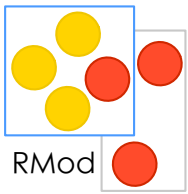
fct (2) = 6
fct (20) = 420

Function definition




```
fct(x) = x * x + x

|fct|
fct:= [:x | x * x + x].
```

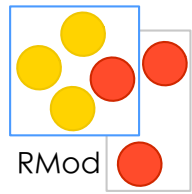
Function Application



fct (2) = 6
fct (20) = 420

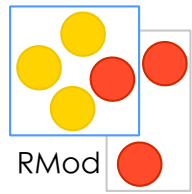
fct value: 2
> 6
fct value: 20
> 420

Other examples




```
[2 + 3 + 4 + 5] value
[:x | x + 3 + 4 + 5 ] value: 2
[:x :y | x + y + 4 + 5] value: 2 value: 3
```

Block



anonymous function

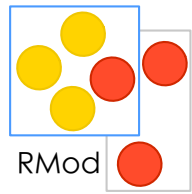
```
[ :variable1 :variable2 |
        | tmp |
        expression1.
        ...variable1 ... ]
```

To execute the function, use the

value: ... value: ...

message

Block



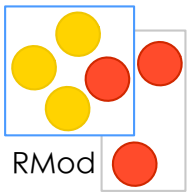
anonymous function — represented as an object
Really really cool!
Can be passed to methods, stored in instance variables ...

```
[ :variable1 :variable2 |
        | tmp |
        expression1.
        ...variable1 ...    ]

value: ... value: ...
```

Roadmap

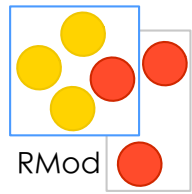
Fun with conditional

Example



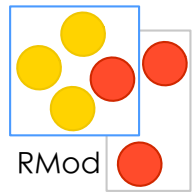

```
3 > 0
    ifTrue:['positive']
    ifFalse:['negative']
```

Example




```
3 > 0
    ifTrue:['positive']
    ifFalse:['negative']

> 'positive'
```

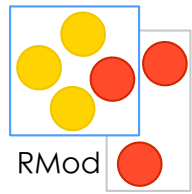
Yes ifTrue:ifFalse: is a message!



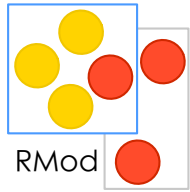

```
Weather isRaining
    ifTrue: [self takeMyUmbrella]
    ifFalse: [self takeMySunglasses]
```

ifTrue:ifFalse is sent to an object: a boolean!

Booleans

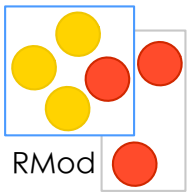


& | not
or: and: (lazy)
xor:
ifTrue:ifFalse:
ifFalse:ifTrue:
...



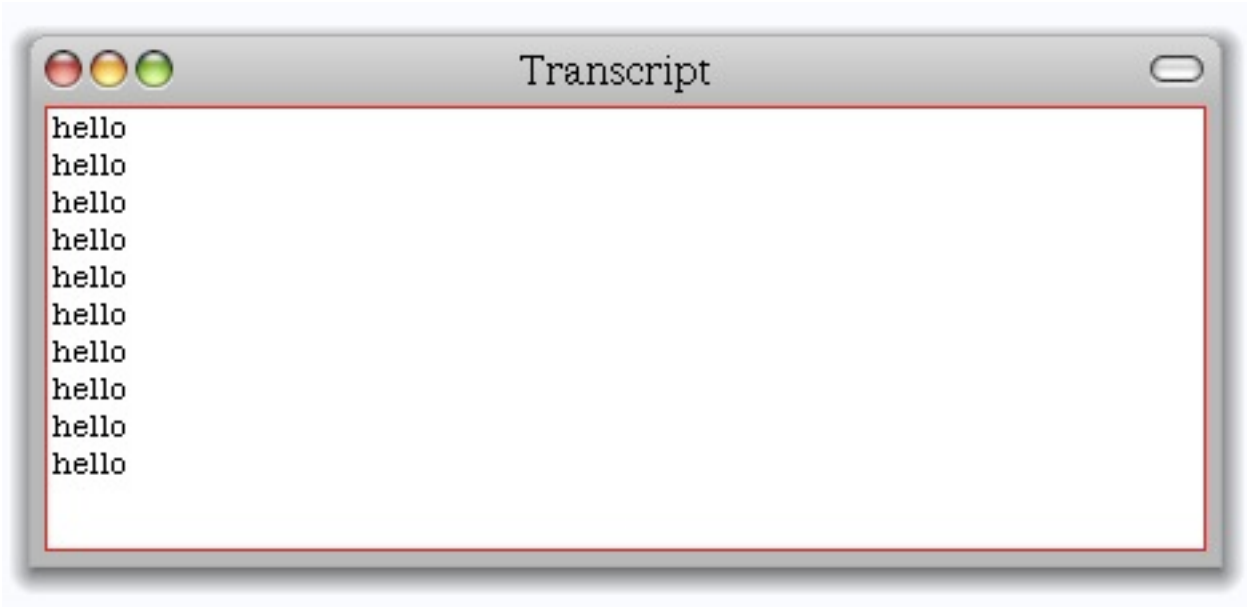
Yes! ifTrue:ifFalse: is a message send to a Boolean.

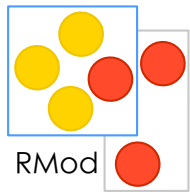
But optimized by the compiler :)



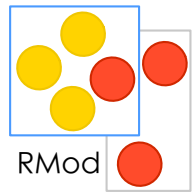
10 timesRepeat: [Transcript show: 'hello'; cr]

10 timesRepeat: [Transcript show: 'hello'; cr]





[x<y] whileTrue: [x := x + 3]



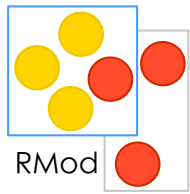
aBlockTest whileTrue

aBlockTest whileFalse

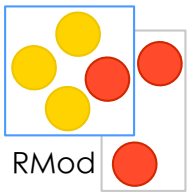
aBlockTest whileTrue: *aBlockBody*

aBlockTest whileFalse: *aBlockBody*

anInteger timesRepeat: *aBlockBody*

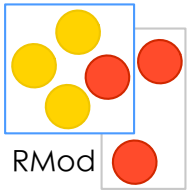


Confused about () and [] ?



Use [ ] when you do not know the number of times something may be executed

```
(x isBlue) ifTrue: [ x schroumph ]

n timesRepeat: [ self shout ]
```

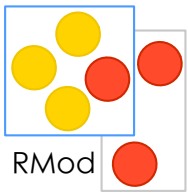


Control statement of other languages are replaced by messages sent to booleans:

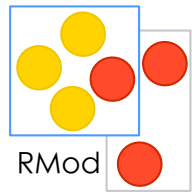
(x isBlue) ifTrue: [ ]

Roadmap

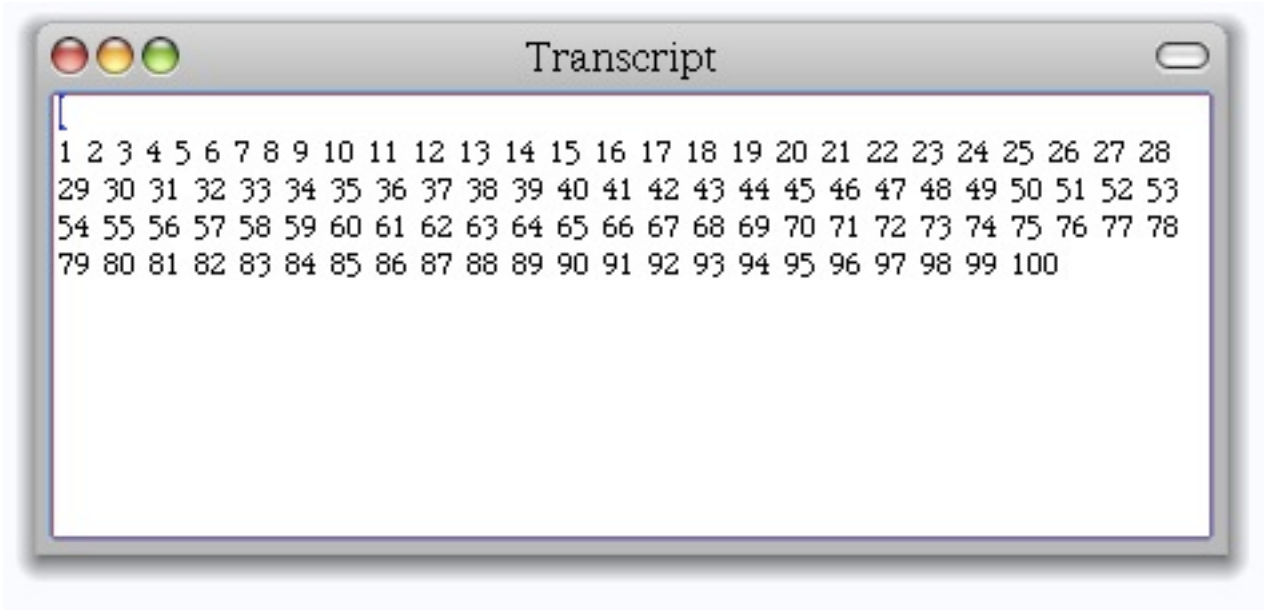
Fun with loops

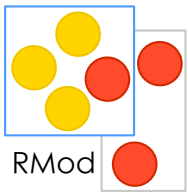



```
1 to: 100 do:
    [ :i | Transcript show: i ; space]
```

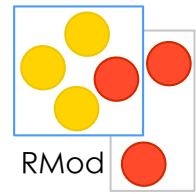



```
1 to: 100 do:
    [ :i | Transcript show: i ; space]
```

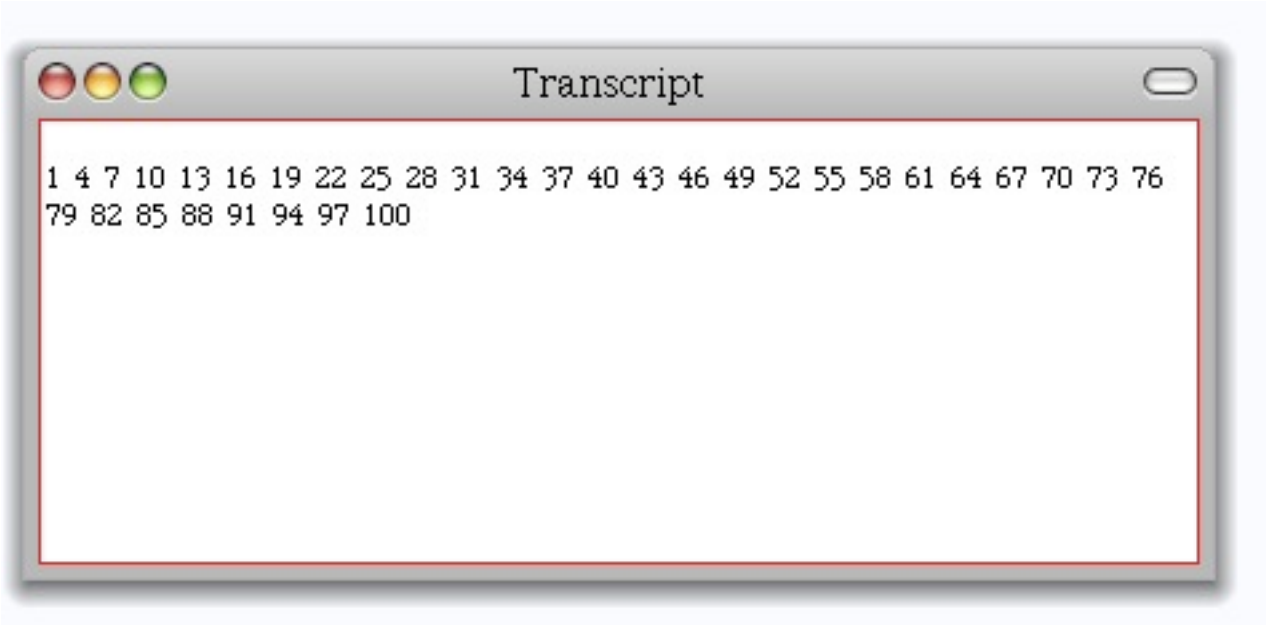


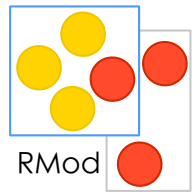



```
1 to: 100 by: 3 do:
    [ :i | Transcript show: i ; space]
```




```
1 to: 100 by: 3 do:
    [ :i | Transcript show: i ; space]
```

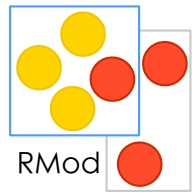




So: yes, there are real loops in Smalltalk!

to:do:
to:by:do:

are just messages send to integers



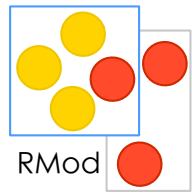
So: yes, there are real loops in Smalltalk!

to:do:
to:by:do:

are just messages send to integers

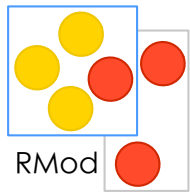
Roadmap

Fun with iterators

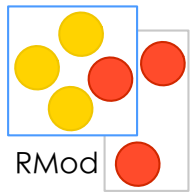



```
ArrayList<String> strings
                = new ArrayList<String>();
for(Person person: persons)
        strings.add(person.name());
```

```
strings :=
persons collect [:person | person name].
```

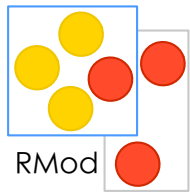


#(2 -3 4 -35 4) **collect:** [:each| each abs]

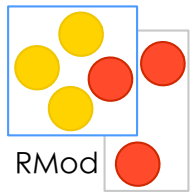


#(2 -3 4 -35 4) **collect:** [:each| each abs]

> #(2 3 4 35 4)

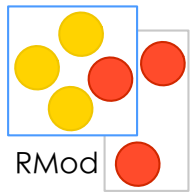


#(15 10 19 68) **collect:** [:i | i odd]



#(15 10 19 68) **collect:** [:i | i odd]

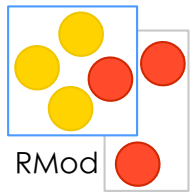
> #(true false true false)



#(15 10 19 68) **collect:** [:i | i odd]

We can also do it this way:

```
|result|
aCol :=  #( 2 -3 4 -35 4).
result := aCol species new: aCol size.
1 to: aCollection size do:
        [ :each | result at: each put: (aCol at: each) odd].
result
```

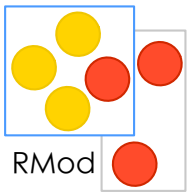


#(15 10 19 68) **collect:** [:i | i odd]

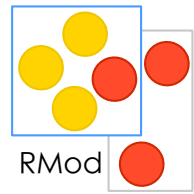
We can also do it this way:

```
|result|
aCol :=  #( 2 -3 4 -35 4).
result := aCol species new: aCol size.
1 to: aCollection size do:
        [ :each | result at: each put: (aCol at: each) odd].
result
```

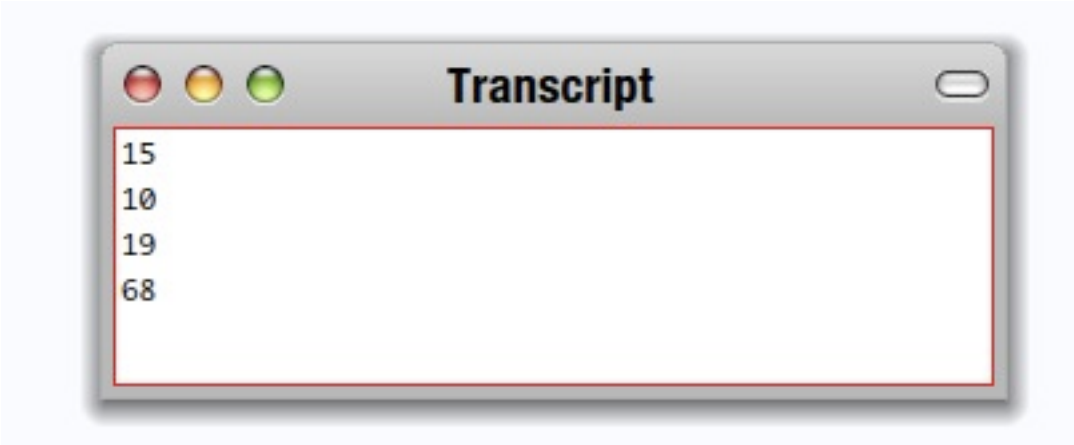
But don't!

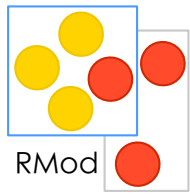



```
#(15 10 19 68) do:
    [:i | Transcript show: i ; cr ]
```

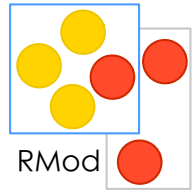



```
#(15 10 19 68) do:
    [:i | Transcript show: i ; cr ]
```





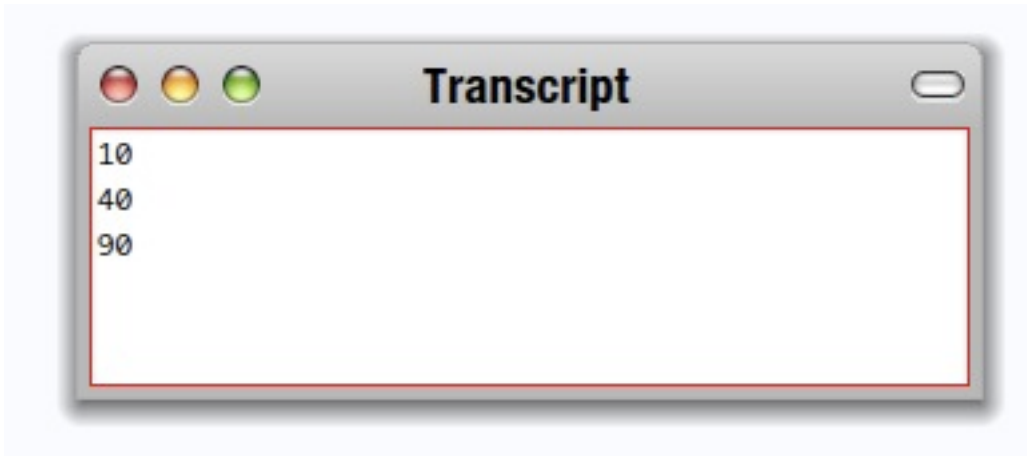

```
#(1 2 3)
    with: #(10 20 30)
    do: [:x :y| Transcript show: (y * x) ; cr ]
```

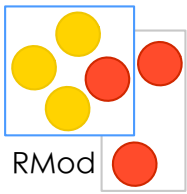


#(1 2 3)

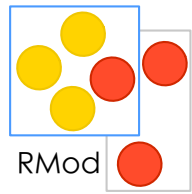
with: #(10 20 30)

do: [:x :y| Transcript show: (y * x) ; cr]





How is do: implemented?



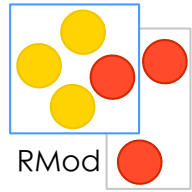
How do: is implemented?

SequenceableCollection ›› do: aBlock

"Evaluate aBlock with each of the receiver's elements as the argument."

```
| to: self size do: [:i | aBlock value: (self at: i)]
```

Some others... make them your friends



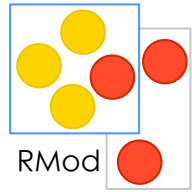
#(15 10 19 68) select: [:i|i odd]

#(15 10 19 68) reject: [:i|i odd]

#(12 10 19 68 21) detect: [:i|i odd]

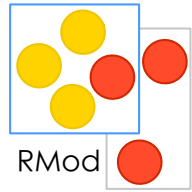
#(12 10 12 68) detect: [:i|i odd] ifNone:[1]

Some others... make them your friends



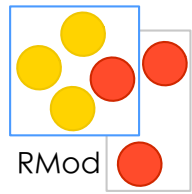

```
#(15 10 19 68) select: [:i|i odd]
  > #(15 19)

#(15 10 19 68) reject: [:i|i odd]

#(12 10 19 68 21) detect: [:i|i odd]

#(12 10 12 68) detect: [:i|i odd] ifNone:[1]
```

Some others... make them your friends



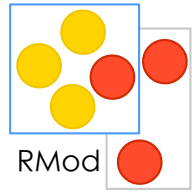

```
#(15 10 19 68) select: [:i|i odd]
  > #(15 19)

#(15 10 19 68) reject: [:i|i odd]
  > #(10 68)

#(12 10 19 68 21) detect: [:i|i odd]


#(12 10 12 68) detect: [:i|i odd] ifNone:[1]
```

Some others... make them your friends

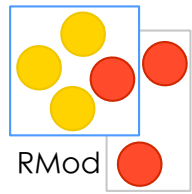



```
#(15 10 19 68) select: [:i|i odd]
  > #(15 19)

#(15 10 19 68) reject: [:i|i odd]
  > #(10 68)

#(12 10 19 68 21) detect: [:i|i odd]
  > 19

#(12 10 12 68) detect: [:i|i odd] ifNone:[1]
```

Some others... make them your friends

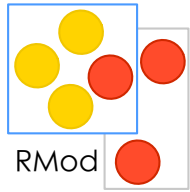



```
#(15 10 19 68) select: [:i|i odd]
  > #(15 19)

#(15 10 19 68) reject: [:i|i odd]
  > #(10 68)

#(12 10 19 68 21) detect: [:i|i odd]
  > 19

#(12 10 12 68) detect: [:i|i odd] ifNone:[1]
  > 1
```



Iterators are your best friends

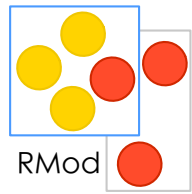
- compact
- nice abstraction
- puts the code with the data structure
- Just messages sent to collections



Iterators are your best friends

- compact
- nice abstraction
- puts the code with the data structure
- Just messages sent to collections

A simple exercise

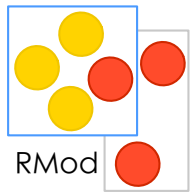


How do you write a method that does this?

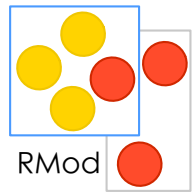
#() :→ (*nothing*)

#(a) :→ a

#(a b c) :→ a, b, c



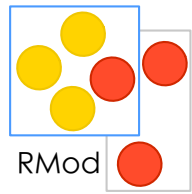

```
#(a b c)
    do: [:each | Transcript show: each]
    separatedBy: [Transcript show: ', ']
```




```
#(a b c)
do: [:each | Transcript show: each]
separatedBy: [Transcript show: ', ']
```

More fun with Messages

Messages Sequence

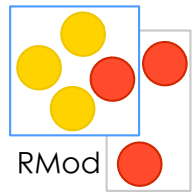



```
message1 .
message2 .
message3
```

. is a separator, not a terminator

```
| macNode pcNode node1 printerNode |
macNode := Workstation withName: #mac.
Transcript cr.
Transcript show: 1 printString.
Transcript cr.
Transcript show: 2 printString
```

Multiple messages to one object ;



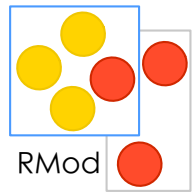
To send multiple messages to the same object, use ;

```
Transcript show: 3 printString; cr
```

is equivalent to:

```
Transcript show: 3 printString.
Transcript cr
```

Hints ...

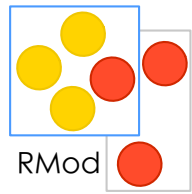



```
x isNil ifTrue: [...]
```

better:

```
x ifNil: [...]
```

Hints ...

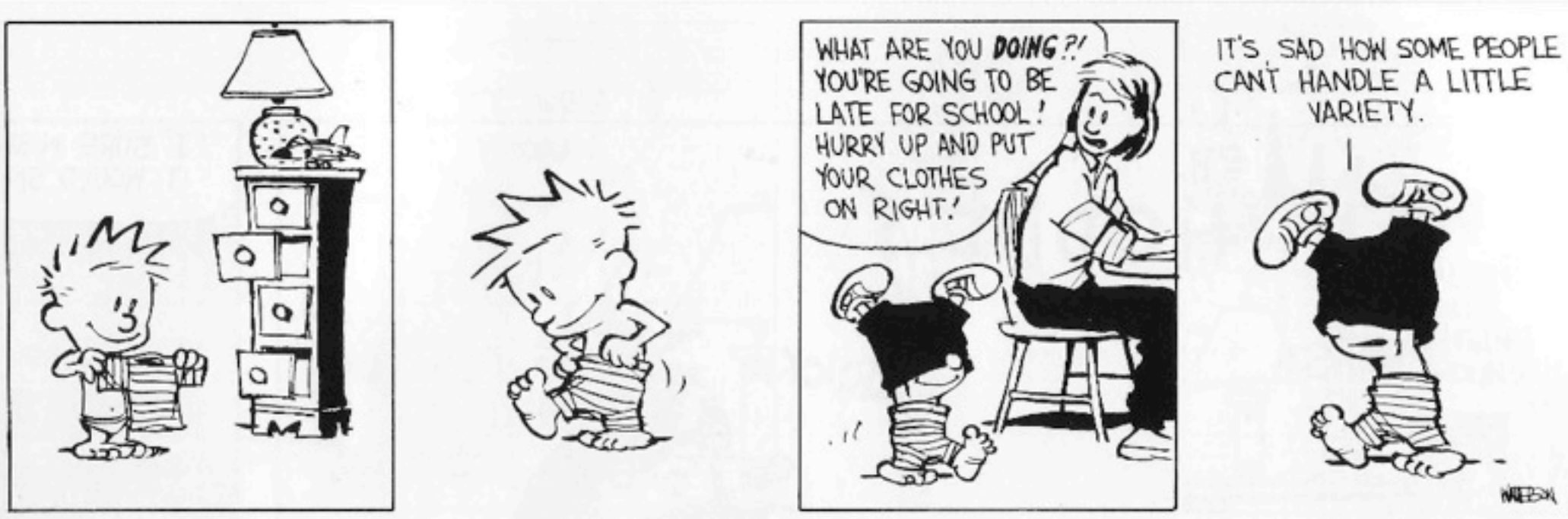


x includes: 3 ifTrue: [...]

is read as sending the message **includes:ifTrue:**

So: use parenthesis

(x includes: 3) ifTrue: [...]


WHAT ARE YOU DOING?! YOU'RE GOING TO BE LATE FOR SCHOOL! HURRY UP AND PUT YOUR CLOTHES ON RIGHT!
IT'S SAD HOW SOME PEOPLE CAN'T HANDLE A LITTLE VARIETY.

Smalltalk is fun

Pure, simple, powerful

www.seaside.st
www.dabbledb.com
www.pharo-project.org