

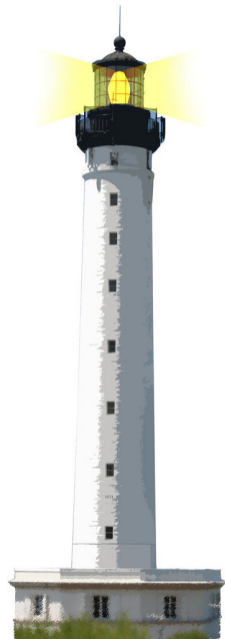
# Message Sends are Plans for Reuse

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<http://www.pharo.org>



# About This Lecture

Another design lecture:

- Next step of the `not` implementation lecture
- Relevant to any object-oriented language
- May change your view on design



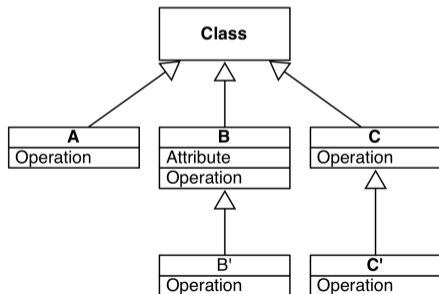
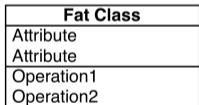
# What You Will Learn

- Message sends are hooks for subclasses
- "I like big methods because I can see all the code" leads to bad design
- Why writing small methods is a sign of good design



# Sending A Message Leads to a Choice

- a message send leads to a choice
- a class hierarchy defines the choices
- self always represents the receiver
- method lookup starts in the class of the receiver



# An Example

```
Node >> setWindowWithRatioForDisplay
| defaultNodeSize |
defaultNodeSize := mainCoordinate / maximizeViewRatio.
self window add:
  (UINode new
   with: bandwidth * 55 / defaultWindowSize).
previousNodeSize := defaultNodeSize.
```

We want to change the `defaultNodeSize` formula in a subclass



# Duplication

Duplicate the code in a subclass

Node subclass: `OurSpecificNode`

...

```
OurSpecificNode >> setWindowWithRatioForDisplay  
| defaultNodeSize |  
defaultNodeSize :=  
  (mainCoordinate / maximizeViewRatio) + 10.  
self window add:  
  (UINode new  
    with: bandwidth * 55 / defaultWindowSize).  
previousNodeSize := defaultNodeSize.
```

# Avoid Duplication

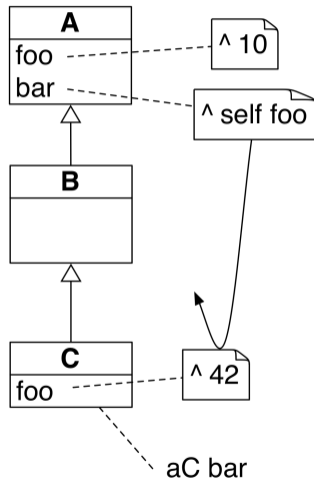
- in Java-like languages, using `private` attributes makes duplication in subclasses impossible
- duplication is not a good practice:
  - duplication copies bugs
  - changing one copy requires changing others



# Solution

- send messages
- define small methods

Subclasses can override such methods





# We can Refactor this

```
Node >> setWindowWithRatioForDisplay
| defaultNodeSize |
defaultNodeSize := (mainCoordinate / maximizeViewRatio).
self window add:
  (UINode new
   with: bandWidth * 55 / defaultWindowSize).
previousNodeSize := defaultNodeSize.
```

# Better Design

```
Node >> setWindowWithRatioForDisplay  
| defaultNodeSize |  
defaultNodeSize := self ratio.  
self window add:  
  (UINode new  
    with: bandWidth * 55 / defaultWindowSize).  
previousNodeSize := defaultNodeSize.
```

```
Node >> ratio  
^ mainCoordinate / maximizeViewRatio
```



# Subclasses Reuse Superclass Logic

```
Node >> ratio
```

```
  ^ mainCoordinate / maximizeViewRatio
```

A subclass can refine the behavior

```
OurSpecificNode >> ratio
```

```
  ^ super ratio + 10
```

## Another Step

```
Node >> setWindowWithRatioForDisplay  
| defaultNodeSize |  
defaultNodeSize := self ratio.  
self window add:  
  (UINode new  
    with: bandwidth * 55 / defaultWindowSize).  
previousNodeSize := defaultNodeSize.
```

We can also extract the UINode instantiation.

## Another Step

```
Node >> setWindowWithRatioForDisplay  
| defaultNodeSize |  
defaultNodeSize := self ratio.  
self window add: self uiNode.  
previousNodeSize := defaultNodeSize.
```

```
Node >> uiNode  
^ UINode new  
with: bandwidth * 55 / defaultWindowSize
```

# Do Not Hardcode Class Use

```
Node >> uiNode  
  ^ UINode new  
    with: bandWidth * 55 / defaultWindowSize
```

# Define Methods Returning Classes

```
Node >> uiNode  
  ^ self uiNodeClass new  
  with: bandwidth * 55 / defaultWindowSize.
```

```
Node >> uiNodeClass  
  ^ UINode
```



# Many Small Messages

- Some developers complain about all these small methods
- They try to understand code line by line
- This does not scale

Small messages are a sign of good design





# Avoid Magic Numbers

```
Node >> uiNode  
  ^ self uiNodeClass new  
    with: bandwidth * 55 / defaultWindowSize.
```

- subclasses may want to change values
  - do not hardcode magic numbers (55)

# Use a Message Send

```
Node >> uiNode  
  ^ self uiNodeClass new  
    with: bandWidth * self averageRatio / defaultWindowSize.
```

```
Node >> averageRatio  
  ^ 55
```

- this gives a name to a value
- subclasses can override the value

How to let the class users change the value?



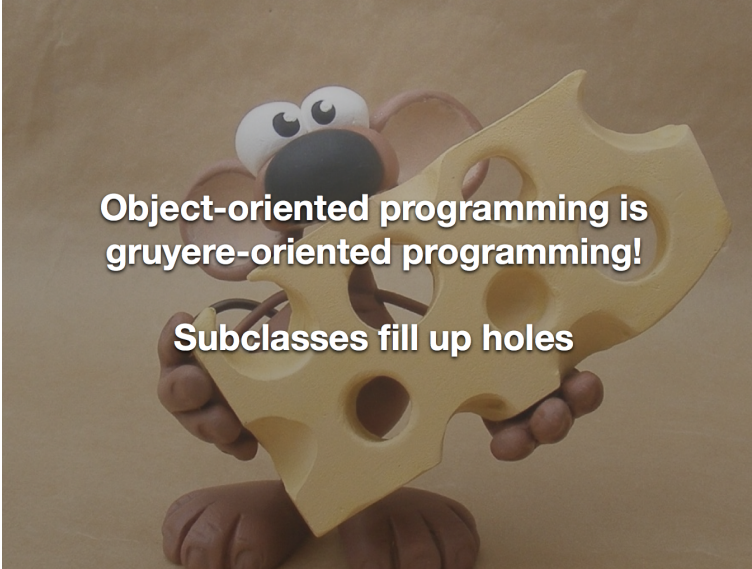
# Use an Instance Variable

```
Node >> averageRatio
^ averageRatio ifNil: [ self defaultAverageRatio ]
Node >> defaultAverageRatio
^ 55
Node >> averageRatio: aNumber
averageRatio := aNumber
```

- subclasses can override the value
- class users can set the value



# Gruyere-Oriented Programming

A cartoon mouse with large eyes and a black nose is holding a large, irregularly shaped piece of yellow Gruyere cheese. The cheese has several circular holes of varying sizes. The mouse is holding the cheese with its front paws. The background is a plain, light brown surface.

**Object-oriented programming is  
gruyere-oriented programming!**

**Subclasses fill up holes**

# Conclusion

- Code can be reused and refined in subclasses
- Sending a message in a class defines a hook:
  - i.e., a place where subclasses can inject variations
- Prefer small methods because:
  - this gives names to expressions
  - this gives freedom to subclasses



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