CSE 341: Section 9

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Outline

Dispatch Overview

Mixins

The Visitor Pattern

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Multiple Dispatch (or *Multimethods*) is the generalization of Double Dispatch

```
class A
 def f x
      x.fWithA self
 end
 def fWithA a
       "(a, a) case"
 end
 def fWithB b
       "(b, a) case"
 end
end
```

```
class B
 def f x
      x.fWithB self
 end
 def fWithA a
       "(a, b) case"
 end
 def fWithB b
       "(b, b) case"
 end
end
```

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- Have the principal method¹ call another method on its first parameter and pass yourself (i.e. literally self) as an argument
- The method the principal method is calling will implicitly know the class of the self parameter passed to it (it was defined to deal with this class)
- By **Single Dispatch**, the method the principal method is calling will also know the class of the principal method's first parameter

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- Extending or overriding depends on the order in which mixins are included in the class definition
- Often more powerful than helper methods because mixin methods have access to self (and instance variables) not defined in the mixin

```
module Doubler
 def double
   # Assumes this is included in classes with '+'
   self + self
 end
end
class String
 include Doubler
end
class AnotherPt
 attr_accessor :x, :y
 include Doubler
 def + other
   ans = AnotherPt.new
   ans.x = self.x + other.x
   ans.y = self.y + other.y
   ans
end
```

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Regarding *instance variables*, the **mixin** methods are included in the same object

 It is bad style for mixin methods to use instance variables since names can clash

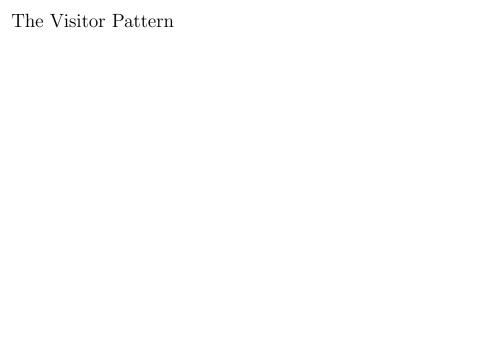
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Here are two powerful mixins in Ruby

- Comparable Defines <, >, >=, <=, != in terms of <=>
 - http://ruby-doc.org/core-2.2.3/Comparable.html
- Enumerable Defines many iterators (e.g. map, find) in terms of each
 - http://ruby-doc.org/core-2.2.3/Enumerable.html



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This pattern relies on **Double Dispatch**

- Dispatch is based on (<Vistor Type>, <Value Type>) pairs
- Heavily used in compilers
 - Often used to compute over ASTs (abstract syntax trees)