CSc 372

Comparative Programming Languages

34 : Ruby — Modules

Department of Computer Science
University of Arizona

collberg@gmail.com

Christian Collberg

Namespaces

- Modules define *namespaces*. This allows you to have several methods or constants with the same name.

```
module Duck
   def Duck.speak()
      return "quack"
   end
end
```

```
module Goose
   def Goose.speak()
      return "honk"
   end
end
```

Methods in Modules

- Outside of the module `M`, you refer to one of its methods `meth` as `M.meth`:

```
module Duck
   def Duck.speak()
      return "quack"
   end
end
```

```
module Goose
   def Goose.speak()
      return "honk"
   end
end
```

```
puts Duck.speak()
puts Goose.speak()
```

Constants in Modules

- Outside of the module `M` you refer to one of its constants `con` as `M::con`.

```
module Duck
   IS_CUTE = true
end

module Goose
   IS_CUTE = false
end

puts Duck::IS_CUTE
```

Classes in Modules

- You can define a class within a module. Since the class name is essentially a constant, you reference the class using `::`.

```
module Fowl
   class Duck
      def speak()
         puts "quack!"
      end
   end
   class Goose
      def speak()
         puts "honk!"
      end
   end
end
```

```
d = Fowl::Duck.new()
d.speak()
g = Fowl::Goose.new()
g.speak()
```

Modules in Modules

- You can even have modules inside modules!

```
module Birdies
   module Duckie
      def Duckie.speak()
         puts "quack!"
      end
   end
   module Goosie
      def Goosie.speak()
         puts "honk!"
      end
   end
end
```

```
Birdies::Duckie.speak()
Birdies::Goosie.speak()
```

Including Modules

- You can put several definitions in one file:

duckies.rb	goosies.rb

<pre>module Duck
   IS_CUTE = true
 	
   def Duck.speak()
      return "quack"
   end
end</pre>
	<pre>module Goose
	   IS_CUTE = false
	
	   def Goose.speak()
	      return "honk"
	   end
	end</pre>

Including Modules. . .

- You include the file in by saying `"require 'file'"` (or `"load 'file'"` but this will load the definitions multiple times if you load more than once):

main.rb

```
require 'duckies'
require 'goosies'

puts Duck.speak()
puts Goose.speak()
puts Duck::IS_CUTE
```

Mixins

- Create a module with instance methods which may be useful in many different kinds of classes:

```
module Debug
   def printme()
      puts "#{self.class.name}" +
           "(\##{self.object_id})"
   end
end
```

Mixins...

- *Include* a module within a class and its instance methods automatically become available in the class:

```
class Ducktape
   include Debug
   def color()
      puts "silver"
   end
end

d = Ducktape.new()
d.printme()
```

- You're including a *reference* to the module: any change to it will affect all classes in which it is included.

Mixing in module Comparable

- Include `Comparable` in your class and define your own `<=>` method (returning 1, -1, or 0, for greater-than, less-than, or equal, respectively).

```
module Comparable
  def ==(arg)
  end
  def >=(arg)
  end
  def <(arg)
  end
  ...
end
```

Mixing in module Comparable...

```
class Ducktape
   include Comparable
   attr_reader :size
   def initialize(size)
      @size = size
   end
   def <=>(other)
      if self.size > other.size then    return 1
      elsif other.size > self.size then return -1
      else                              return 0
      end
   end
end
```

Mixing in module Comparable. . .

- Your class now gets immediate access to the methods that `Comparable` defines (<, <=, >, >=):

```
small = Ducktape.new(100)
large = Ducktape.new(200)

puts small < large
puts small > large
puts small == large
puts small <= large
puts small >= large
```

Mixing in Enumerable

- Include the `Enumerable` module and define an `each()` method.

```
module Enumerable
  def each_with_index
  end
  def collect
  end
  def sort
  def member?(arg0)
  end
  def inject(arg0, arg1, *rest)
  end
  ...
end
```

Mixing in Enumerable...

```
class Flock
   include Enumerable

   def initialize(mum, dad, babies)
      @mum = mum
      @dad = dad
      @babies = babies
   end

   def each()
      yield @mum
      yield @dad
      @babies.each() {|b| yield b}
   end
end
```

Mixing in Enumerable...

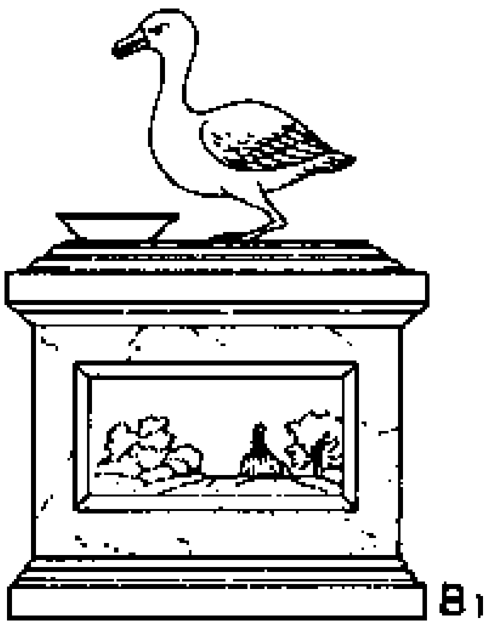
- You now get access to methods such as `collect()`, `sort()`, and `inject()`:

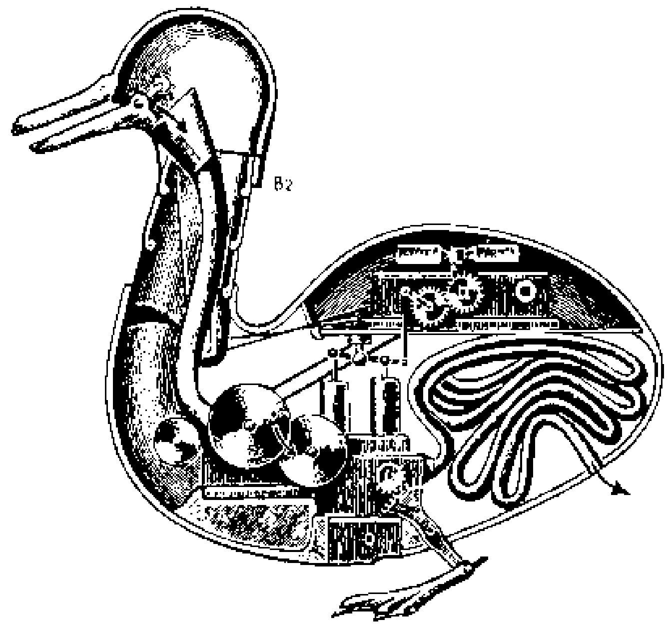
```
f = Flock.new("daisy","donald",
              ["huey","dewey","louie"])

f.each() {|x| puts x}

puts f.collect {|x| x.length()}

puts f.sort()

puts f.inject() {|v,x| (v=="")?x:v+","+x}
```

Readings

- Read Chapter 9, page 117–125, in *Programming Ruby — The Pragmatic Programmers Guide*, by Dave Thomas.

Duck Automata





…[French engineer Jacques] de Vaucanson [1709-82] built …a mechanical duck which could move in the typical, wagging way of a duck, eat and digest fish, and excrete the remains in a "natural" way. The mechanism was driven by a weight and had more than a thousand moving parts…

From: http://music.calarts.edu/~sroberts/articles/DeVaucanson.duck.html