Agile Webentwicklung mit Ruby on Rails

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Sommersemester 2012

Blatt 2

Aufgabe 1: Vector

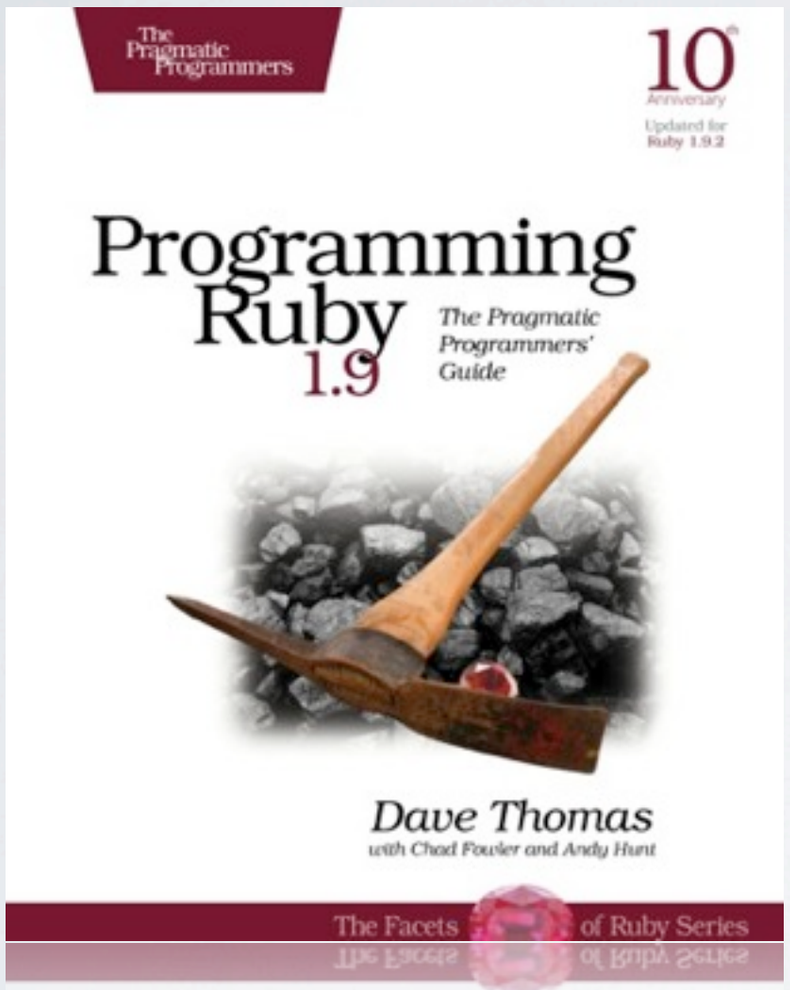
Schreiben Sie eine Klasse `Vector`, welche die folgenden Anforderungen erfüllt:

Der Initializer erwartet als Parameter ein Array mit den Elementen des Vektors. Die Dimension des Vektors soll daraus automatisch bestimmt werden und später auch abfragbar sein.

Ruby

Methoden

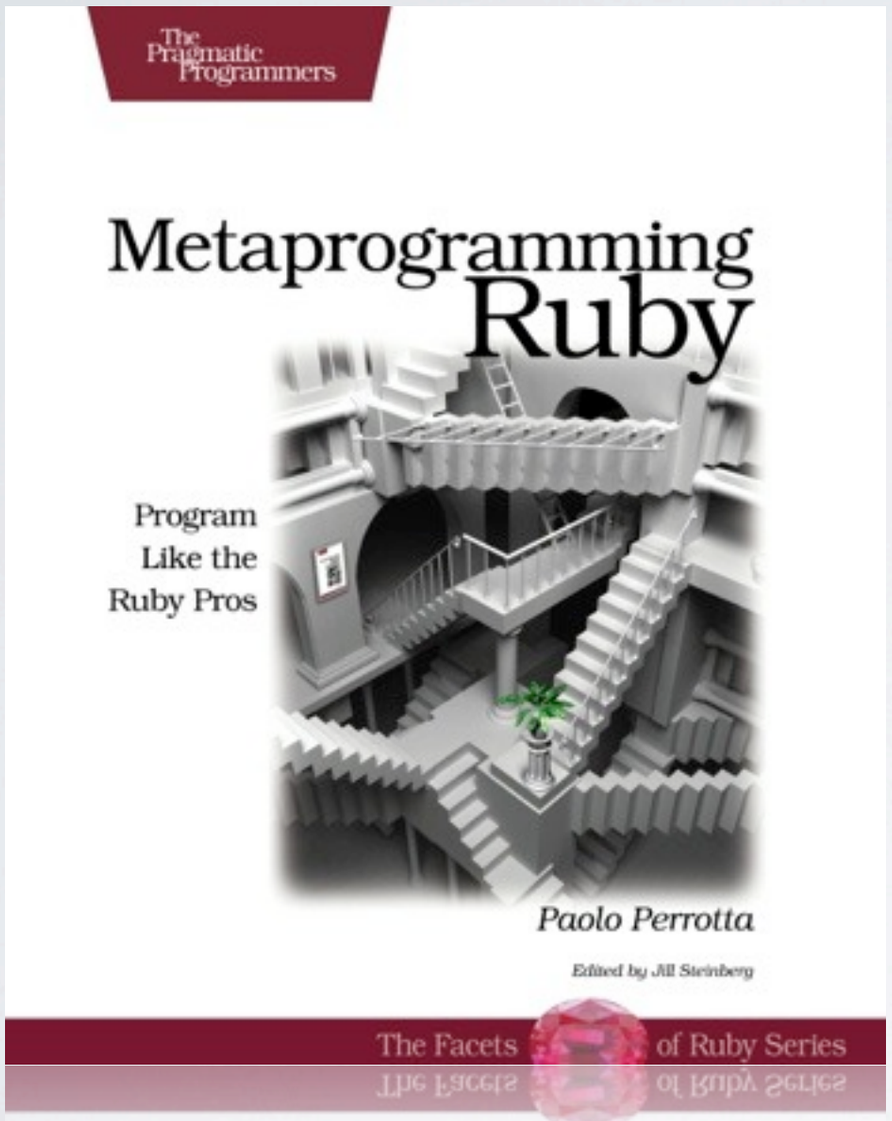
Quellen / Literaturempfehlungen



Dave Thomas,
Chad Fowler,
Andy Hunt,
Programming Ruby 1.9,
Pragmatic Bookshelf, 2009

S. 119-128.
S. 341 f.

Quellen / Literaturempfehlungen



Paolo Perrotta,
Metaprogramming Ruby,
Pragmatic Bookshelf, 2010

S. 38-68.

Parameterübergabe

Ruby

Methoden

Default-Werte

```ruby
def default_args(arg1=42)
  arg1
end

default_args     # => 42
default_args 73 # => 73

def more_default_args(arg1=42, arg2=73)
  "arg1: #{arg1}, arg2: #{arg2}"
end

more_default_args        # => arg1: 42, arg2: 73
more_default_args 23     # => arg1: 23, arg2: 73
more_default_args 23, 5 # => arg1: 23, arg2: 5
```

Variable Argumentlisten

Splat-Operator

```ruby
def varargs(arg1, *rest)
  "arg1: #{arg1}, rest: #{rest}"
end

varargs "one"
# => arg1: one, rest: []

varargs "one", "two"
# => arg1: one, rest: ["two"]

varargs "one", "two", "three"
# => arg1: one, rest: ["two", "three"]
```

Splat-Position beliebig

```ruby
def split_apart(first, *splat, last)
  "First: #{first}, splat: #{splat}, last: #{last}"
end

split_apart 1, 2
# => First: 1, splat: [], last: 2

split_apart 1, 2, 3
# => First: 1, splat: [2], last: 3

split_apart 1, 2, 3, 4
# => First: 1, splat: [2, 3], last: 4
```

Hash-Argumente

```ruby
def hash_params(normal_arg, hash_arg)
  puts "normal_arg: #{normal_arg}, hash_arg: #{hash_arg}"
end

hash_params( 23, { a: 42, b: 73 } )
# => normal_arg: 23, hash_arg: {:a=>42, :b=>73}

hash_params( 23, a: 42, b: 73 )
# => normal_arg: 23, hash_arg: {:a=>42, :b=>73}

songlist.search(
  :singles,
  genre: :jazz,
  duration_less_than: 270
)
```

Block zu Proc konvertieren

```ruby
class TaxCalculator
  def initialize(name, &block)
    @name, @block = name, block
  end

  def tax(amount)
    "#{ @name } on #{ amount }: $#{ @block.call(amount)}"
  end
end

tc = TaxCalculator.new("Sales tax") { |amnt| amnt * 0.075 }

tc.tax(100) # => "Sales tax on 100: $7.5"
tc.tax(250) # => "Sales tax on 250: $18.75"
```

Proc zu Block konvertieren

```
amnt_calculator = lambda { |amnt| amnt * 0.075 }

tc = TaxCalculator.new("Sales tax", &amnt_calculator)

tc.tax(100) # => "Sales tax on 100: $7.5"
tc.tax(250) # => "Sales tax on 250: $18.75"
```

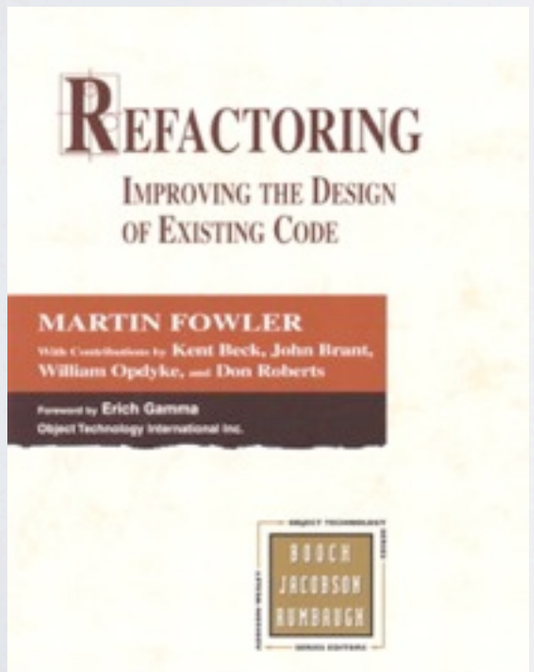
Exkurs: Refactoring

Ruby

Methoden

Refactoring

"Refactoring is the process of changing a software system in such a way that it does not alter the external behaviour of the code yet improves its internal structure. It is a disciplined way to clean up code that minimizes the chances of introducing bugs."



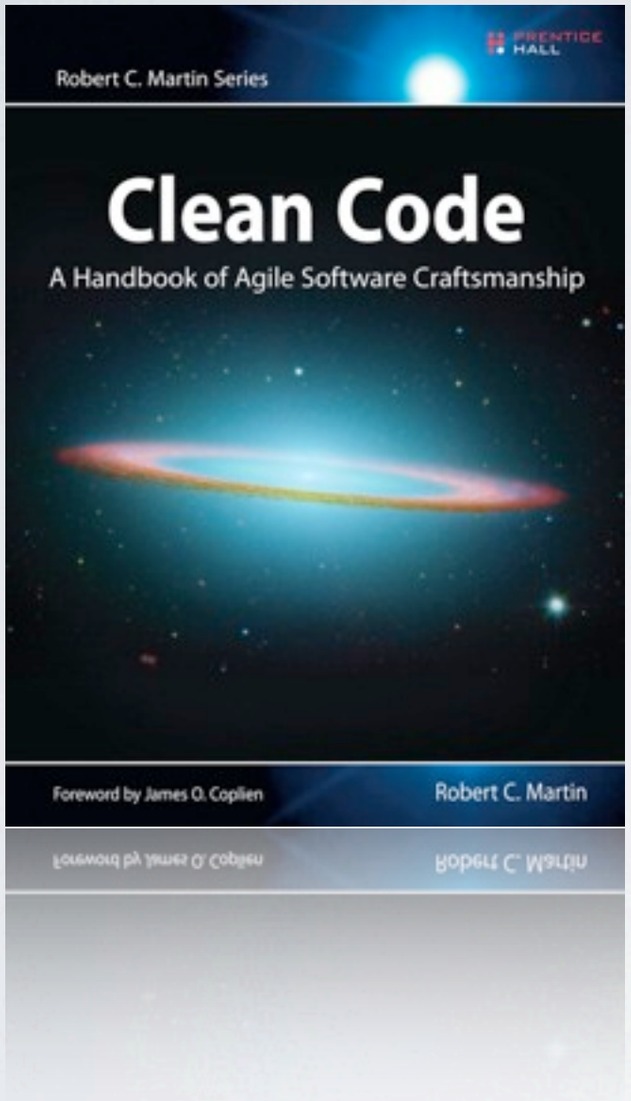
M. Fowler and K. Beck,
Refactoring: Improving the Design of Existing Code.
Addison-Wesley Professional, 1999.

Ruby

Ziel: Clean Code

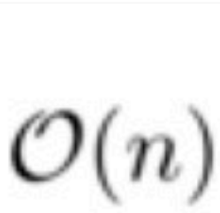
- verbesserte Wartbarkeit und Erweiterbarkeit
  - Fehler zu heben ist einfacher, wenn der Code verständlich und lesbar ist und die Intention des Autors klar kommuniziert.
  - Konventionen und erkennbare Design Patterns erleichtern den Einstieg und das Verständnis.

Clean Code



- Code Conventions
- Design Patterns
- Convention over Configuration
- Don't Repeat Yourself
- ...

R. C. Martin,
Clean Code: A Handbook of Agile Software Craftsmanship.
Pearson Education, 2009.



Computer Science
@CompSciFact

Follow

'No matter how slow you are writing clean code, you will always be slower if you make a mess.' - @UncleBobMartin

Beispielproblem: Workstation Reports

Ruby

Methoden

Legacy System

```
class DS
  def initialize # connect to data source

  def get_mouse_info(workstation_id)      # ...
  def get_mouse_price(workstation_id)     # ...

  def get_keyboard_info(workstation_id)   # ...
  def get_keyboard_price(workstation_id)  # ...

  def get_cpu_info(workstation_id)        # ...
  def get_cpu_price(workstation_id)       # ...

  def get_display_info(workstation_id)    # ...
  def get_display_price(workstation_id)   # ...
  # and so on
end
```

Legacy System

```
ds = DS.new

ds.get_cpu_info(42)     # => 2.16 Ghz
ds.get_cpu_price(42)    # => 150

ds.get_mouse_info(42)   # => Dual Optical
ds.get_mouse_price(42) # => 40
```

Ansatz: Computer-Objekte

```ruby
class Computer
  def initialize(computer_id, data_source)
    @id, @data_source = computer_id, data_source
  end

  def mouse
    info   = @data_source.get_mouse_info(@id)
    price  = @data_source.get_mouse_price(@id)
    result = "Mouse: #{info} ($#{price})"
    result = "* #{result}" if price >= 100
    result
  end

  # and so on
end
```

Dynamische Methodenaufrufe

Ruby

Methoden

Dynamischer Methodenaufruf

```ruby
class MyClass
  def my_method(my_arg)
    my_arg * 2
  end
end

obj = MyClass.new
obj.my_method(3) # => 6

obj.send(:my_method, 3) # => 6
```

Dynamische Aufrufe und Private

```
class MyClass
  private
  def private_method
    puts "private_method()"
  end
end

obj = MyClass.new

obj.send(:private_method)
#  => private_method()
```


Ruby

Dynamic Dispatch

```
class Computer
  # initializer left out

  def mouse
    component :mouse
  end

  # and so on

  private
  def component(name)
    info   = @data_source.send "get_#{name}_info", @id
    price  = @data_source.send "get_#{name}_price", @id
    result = "#{name.to_s.capitalize}: #{info} ($#{price})"
    result = "* #{result}" if price >= 100
    result
  end
end
```

Dynamische Methodendefinitionen

Ruby

Methoden

Dynamische Methodendefinition

```ruby
def MyClass
  define_method :my_method do |my_arg|
    my_arg * 3
  end
end

obj = MyClass.new

obj.my_method(2) # => 6
```

Class Macro

```ruby
class Computer
  # initialize left out

  def self.define_component(name)
    define_method(name) do
      info   = @data_source.send "get_#{name}_info", @id
      price  = @data_source.send "get_#{name}_price", @id
      result = "#{name.to_s.capitalize}: #{info} ($#{price})"
      result = "* #{result}" if price >= 100
      result
    end
  end

  define_component :mouse
  define_component :keyboard
  define_component :cpu
  # and so on
end
```

Introspection

```
class Computer
  def initialize(computer_id, data_source)
    @id, @data_source = computer_id, data_source

    @data_source.methods.grep(/^get_(.*)_info$/) do
      Computer.define_component $1
    end
  end

  def self.define_component(name)
    define_method(name) do
      info   = @data_source.send "get_#{name}_info", @id
      price  = @data_source.send "get_#{name}_price", @id
      result = "#{name.capitalize}: #{info} ($#{price})"
      result = "* #{result}" if price >= 100
      result
    end
  end
```

Ghost Methods

Ruby

Methoden

Ergänzung: Method Lookup

```ruby
class Lawyer; end

nick = Lawyer.new
nick.talk_simple

# undefined method `talk_simple' for
# #<Lawyer:0x007f9b5987bb70> (NoMethodError)

nick.send :method_missing, :talk_simple

# undefined method `talk_simple' for
# #<Lawyer:0x007f9b5987bb70> (NoMethodError)
```

Überschreiben: method_missing

```ruby
class Lawyer
  def method_missing(method, *args)
    puts "You called: #{method} with args (#{args.join(", ")})"
    puts "(You also passed it a block)" if block_given?
  end
end

bob = Lawyer.new
bob.talk_simple(:a, :b) do
  # nothing to do here
end

# You called: talk_simple with args (a, b)
# (You also passed it a block)
```

Dynamic Proxy

```ruby
class Computer
  # initializer left out

  def method_missing(name, *args)
    super unless @data_source.respond_to?("get_#{name}_info")

    info   = @data_source.send "get_#{name}_info", @id
    price  = @data_source.send "get_#{name}_price", @id
    result = "#{name.capitalize}: #{info} ($#{price})"
    result = "* #{result}" if price >= 100
    result
  end

  def respond_to?(method)
    @data_source.respond_to?("get_#{method}_info") || super
  end
end
```

Problem: Vorhandene Methoden

```ruby
my_computer = Computer.new(42, DS.new)
my_computer.display #  => nil

Object.instance_methods.grep(/^d/)
#  => [:dup, :display, ...]
```

Lösung: Blank Slate

```
class Computer
  instance_methods.each do |m|
    pattern = /method_missing|respond_to?/
    undef_method m unless m.to_s =~ pattern
  end
  # ...
end

# blank_slate.rb:3: warning:
#   undefining `object_id' may cause serious problems
# blank_slate.rb:3: warning:
#   undefining `__send__' may cause serious problems

class Computer
  instance_methods.each do |m|
    pattern = /^__|object_id|method_missing|respond_to?/
    undef_method m unless m.to_s =~ pattern
  end
  # ...
end
```

Ghost Method Benchmark

```ruby
class String
  def method_missing(method, *args)
    method == :ghost_reverse ? reverse : super
  end
end

require 'benchmark'
Benchmark.bm do |b|
  b.report 'Normal method' do
    1_000_000.times { "abc".reverse }
  end
  b.report 'Ghost method' do
    1_000_000.times { "abc".ghost_reverse }
  end
end
#                 user     system      total        real
# Normal method  0.280000   0.000000   0.280000 (  0.276858)
# Ghost  method  0.580000   0.000000   0.580000 (  0.581901)
```

Ghost Definition Benchmark

```
class String
  def method_missing(method, *args)

    if method == :ghost_reverse
      String.send(:define_method, :ghost_reverse) { reverse }
    else
      super # args are handled implicit
    end

  end
end
#                      user     system      total        real
# Normal method    0.250000   0.000000   0.250000 (  0.259091)
# Ghost  method    0.580000   0.000000   0.580000 (  0.581901)
# Defined method   0.390000   0.000000   0.390000 (  0.383126)
```

Mehraufwand meist nicht relevant!

Zusammenfassung: Methoden

- Methoden können dynamisch anhand ihres Namens aufgerufen werden
- Zur Laufzeit können Methoden dynamisch definiert und entfernt werden
- Introspection ermöglicht die automatische Definition von Wrappern und erleichtert die Erstellung von Proxy-Klassen
- Mittels *method_missing* lassen sich *Dynamic Proxies* realisieren
- Interferenz mit vorhandenen Methoden kann man durch Einsatz eines *Blank Slate* erreichen
- **Einbußen bei der Performance spielen fast keine Rolle!**

Ruby

Blocks, Procs und Lambdas

Closures

Ruby

Blocks, Procs und Lambdas

Blöcke sind Closures

Binding: Lokale Variablen, Self, Instanzvariablen

```
def my_method
  x = "Goodbye"
  yield "cruel"
end

x = "Hello"

my_method do |y|
  "#{x}, #{y} world."
end
# => Hello, cruel world.
```

Binding bei Aufruf irrelevant

Binding bei Definition relevant

Scopes

Ruby

Blocks, Procs und Lambdas

Scopes

```
v1 = 1

class MyClass
  v2 = 2
  local_variables #  => [:v2]

  def my_method
    v3 = 3
    local_variables
  end

  local_variables # => [:v2]
end

obj = MyClass.new
obj.my_method   # => [:v3]
local_variables # => [:v1, :obj]
```

Scope Gate

Scope Gate

Scope Gate

Scope Gate

Flattening the Scope

```ruby
my_var = "Success"

class MyClass
  # We want to
  # print my_var
  # here...

  def my_method
    # ..and here
  end
end
```

Scope Gate

Scope Gate

Flattening the Scope

```ruby
my_var = "Success"

MyClass = Class.new do
  puts "#{my_var} in the class definition!"

  define_method :my_method do
    puts "#{my_var} in the method!"
  end
end

# => Success in the class definition!

MyClass.new.my_method
# => Success in the the method!
```

Manipulation von Self

Ruby

Blocks, Procs und Lambdas

Blöcke und Self

```
class MyClass
  def my_method
    yield
  end
end

MyClass.new.my_method do
  puts self
end

# => main
```

Self aus Binding des Blocks

Binding und Self

```
class MyClass
  def initialize
    @v = 1
  end
end

obj = MyClass.new

obj.instance_eval do
  self #  => #<MyClass:0x3340dc @v=1>
  @v   #  => 1
end

v = 2
obj.instance_eval { @v = v}
obj.instance_eval { @v } #  => 2
```

Receiver wird *self*

restliches Binding
bleibt unangetastet

Beispiel: Clean Room

```ruby
class CleanRoom
  def complex_calculation
    # ...
  end

  def do_something
    # ...
  end
end

clean_room = CleanRoom.new
clean_room.instance_eval do
  if complex_calculation > 10
    do_something
  end
end
```

Bereitstellen von Helfermethoden

Auswertung des Blocks in kontrollierbarer Umgebung

Callable Objects

Ruby

Blocks, Procs und Lambdas

Callable Objects

impliziter Aufruf des current block

Lambda

Proc

konvertierter Block

```ruby
def my_method
  yield #  => call current block
end
my_method { puts "Hello!" } # => Hello!

l = lambda { puts "Hello, Lambda!" }
l.call # => Hello, Lambda!
l.class # => Proc

p = Proc.new { puts "Hello, Proc!" }
p.call #  => Hello, Proc!
p.class #  => Proc

def other_method(&block)
  block.class
end
#  => Proc
```

Procs vs. Lambdas

```ruby
l = lambda { puts "Hello" }
l.lambda? # => true

p = Proc.new { puts "Hello" }
p.lambda? # => false

def my_method(&block)
  block.lambda?
end

my_method { puts "Hello" }
# => false
```

Procs, Lambdas und Return

```ruby
def lambda_double
  l = lambda { return 10 }
  l.call * 2
end

lambda_double #  => 20

def proc_double
  p = Proc.new { return 10 }
  p.call * 2
end

proc_double #  => 10
```

bei Lambda
nur return
aus dem Block

bei Proc
return
aus der Methode

Ruby

Procs, Lambdas und Arity

```ruby
p = Proc.new { |a,b| [a, b] }
p.arity # => 2

p.call(1, 2)      # => [1, 2]

p.call(1, 2, 3) # => [1, 2]

p.call(1)         # => [1, nil]

l = lambda { |a,b| [a, b] }
l.arity # => 2

l.call(1, 2) # => [1, 2]

l.call(1)
# =>[...] wrong number of arguments
#             (1 for 2) (ArgumentError)
```

Procs behandeln Argumente entsprechend der Erwartung

Lambdas prüfen strikt, ob Argumentliste korrekt

Zusammenfassung: Procs/Lambdas

- Blöcke werden mit dem Binding ausgewertet, in dem sie definiert werden
- Klassen-, Modul- und Methodendefinitionen sind *Scope Gates*
- Das aktuelle Objekt (self) des Bindings eines Blocks lässt sich mit *instance_eval* manipulieren
- Lambdas und Procs verhalten sich unterschiedlich im Bezug auf *return* und *arity*

Ruby