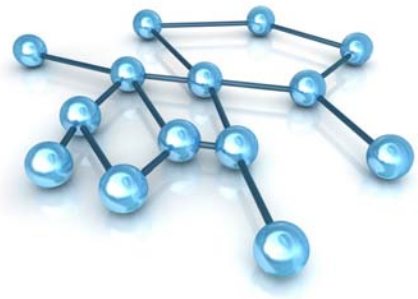
“design patterns” in ruby



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housekeeping

ask questions anytime

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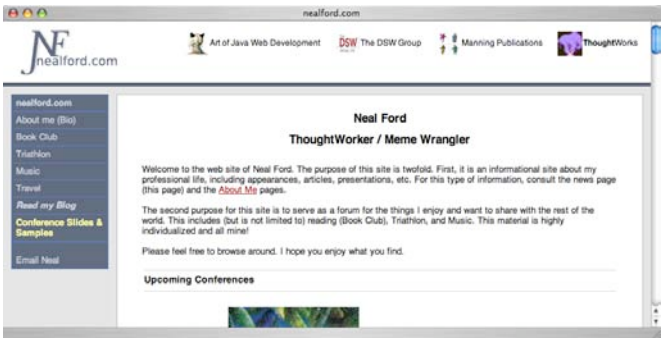


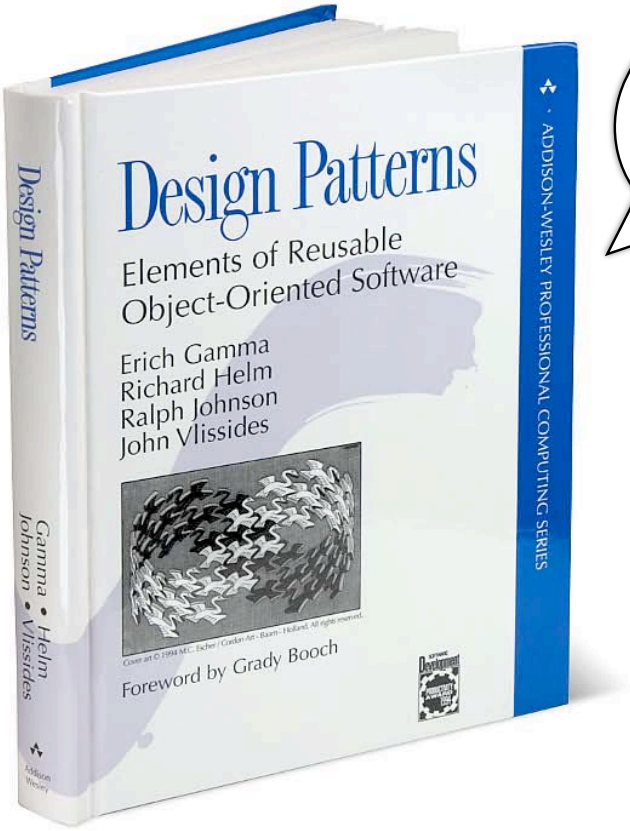
download samples from `github.com/nealford`

pattern solutions from weaker languages

have more elegant solutions

blended whisky is made from several single malts

cask strength



Making C++ Suck Less

patterns define common problems

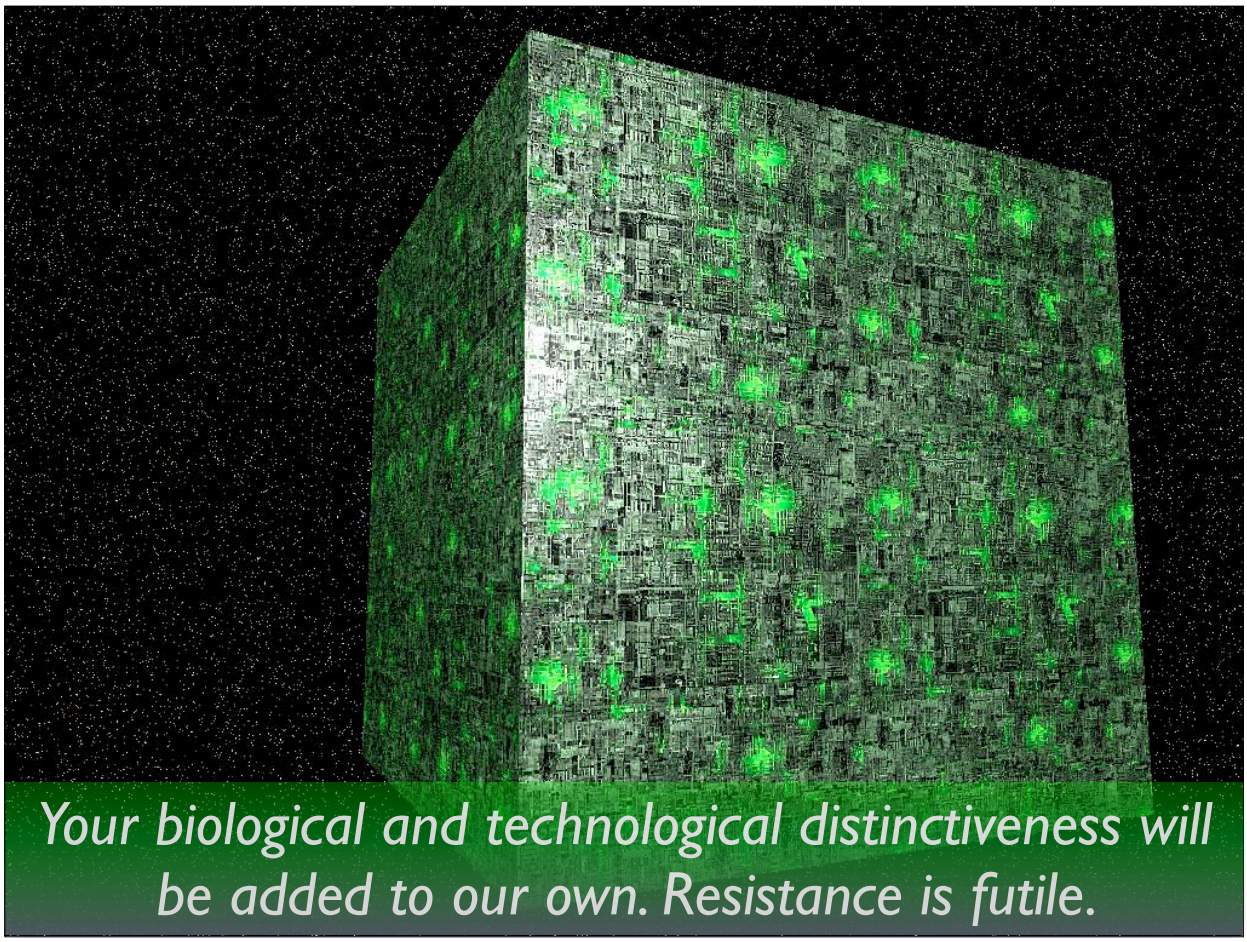
dynamic languages give you better tools to solve those problems

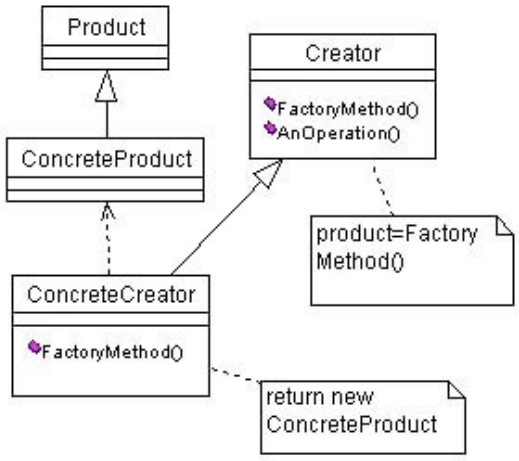
"Go To Statement Considered Harmful"

Edsger W. Dijkstra

Communications of the ACM, Vol. 11, No. 3, March 1968, pp. 147-148.

the gof patterns redux





Define an interface for creating an object, but let subclasses decide which class to instantiate. Factory method lets a class defer instantiation to subclasses.

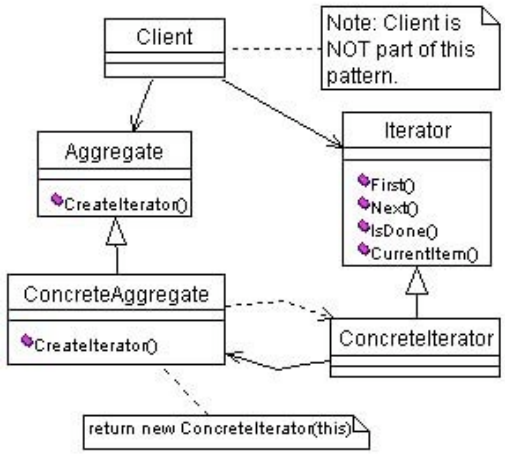
construction isn't special

```ruby
def test_construction
  a = Array.new
  assert a.kind_of? Array

  b = Array.send(:new)
  assert b.kind_of? Array
end
```

factory "design pattern"

```ruby
def create_from_factory(factory)
  factory.new
end

def test_factory
  list = create_from_factory(Array)
  assert list.kind_of? Array

  hash = create_from_factory(Hash)
  assert hash.is_a? Hash
end
```

iterator

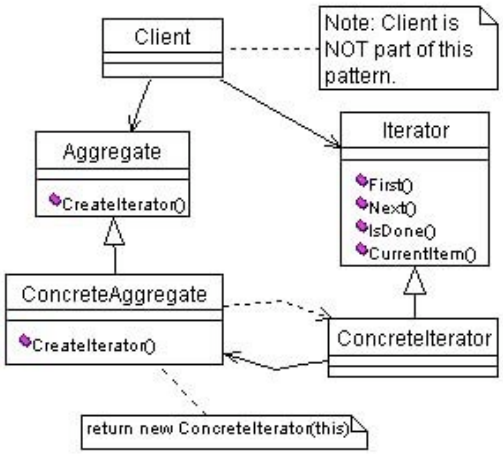


Provide a way to access the elements of an aggregate object sequentially without exposing its underlying representation.

```ruby
def print_all_in container
  output = ""
  for i in 0..container.length - 1 do
    output += "#{container[i]} "
  end
  output
end

def setup
  @it = IteratorDemo.new
  @numbers = [1, 2, 3, 4]
  @words = %w(first second third fourth)
end

def test_simple_iterator
  assert_equal("1 2 3 4 ",
      @it.print_all_in(@numbers))
  assert_equal("first second third fourth ",
      @it.print_all_in(@words))
end
```

```ruby
def print_all_with_internal container
  output = ""
  container.each do |n|
    output += "#{n} "
  end
  output
end


def test_internal_iterator
  assert_equal("1 2 3 4 ",
      @it.print_all_with_internal(@numbers))
  assert_equal("first second third fourth ",
      @it.print_all_with_internal(@words))
end
```

ceremony



vs.

essence

```
numbers.each do |n|
  puts n
end
```

internal vs. external iterators

.each is an *internal* iterator

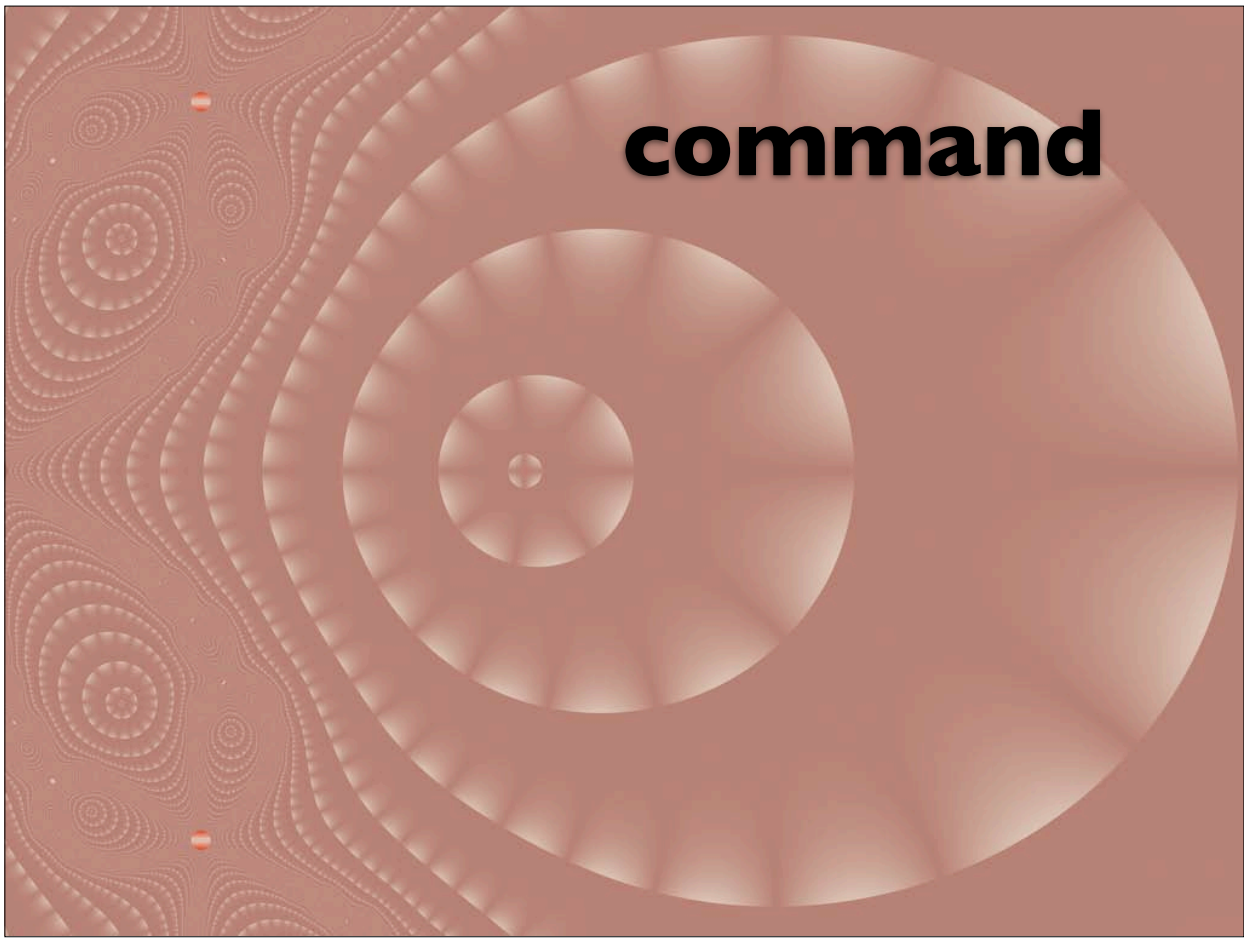
ruby 1.8 has no default syntax for external iterators

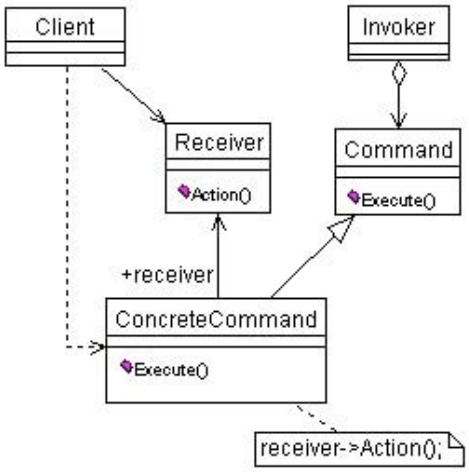
ruby 1.9 adds *enumerators* on collections

external iterator

```
iterator = 9.downto(1)
loop do
  print iterator.next
end
puts "...blastoff!"
```

1.9

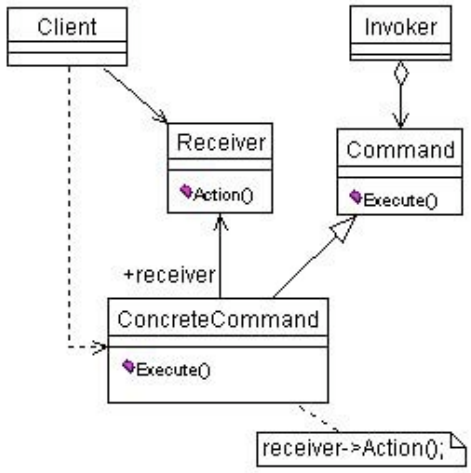




Encapsulate a request as an object, thereby letting you parameterize clients with different requests, queue or log requests, and support undoable operations.

commands == closures

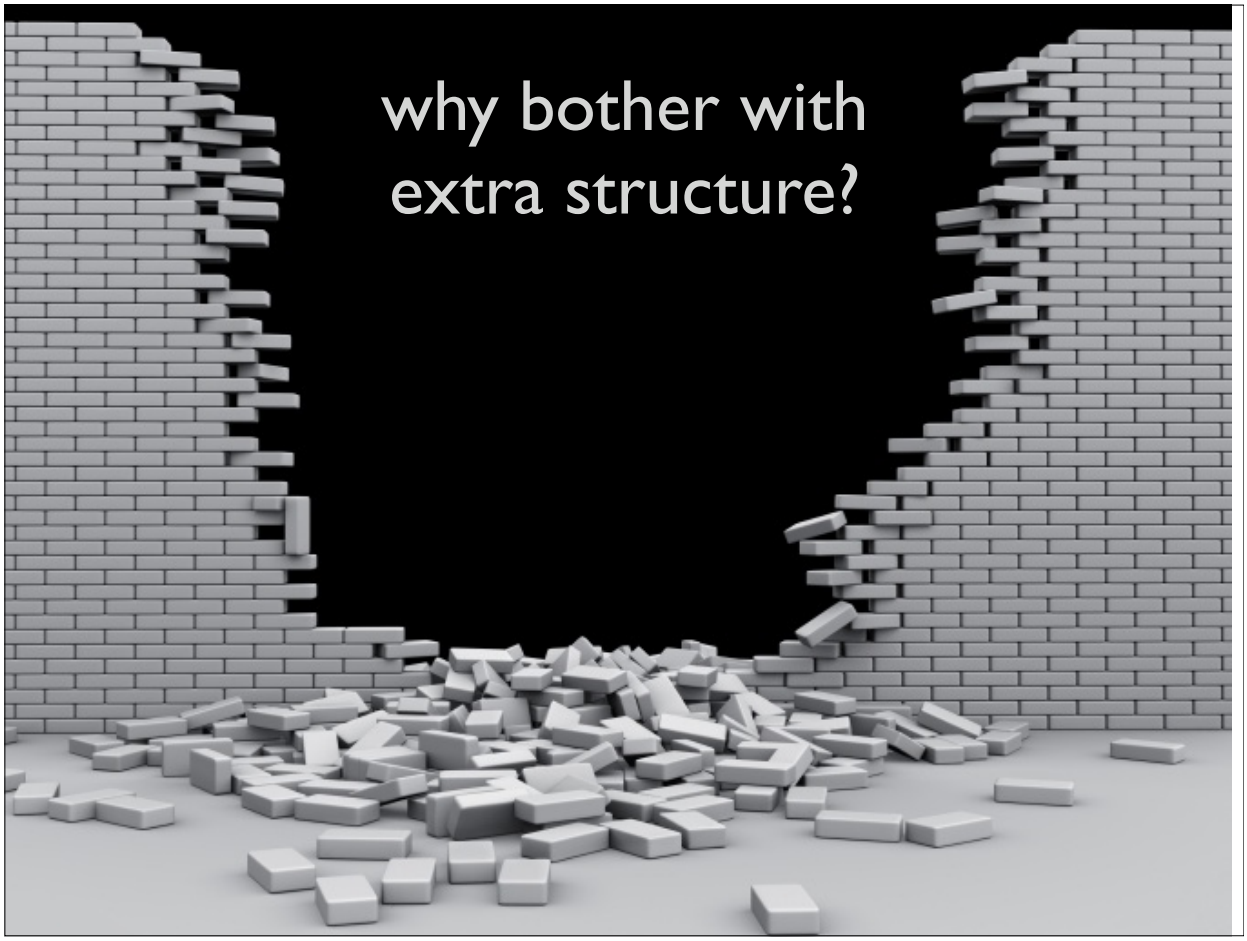
```ruby
def test_counting
  count = 0
  commands = []
  (1..10).each do |i|
      commands << proc { count += 1 }
  end

  assert_equal(0, count)
  commands.each { |c| c.call }
  assert_equal(10, count)
end
```



Encapsulate a request as an object, thereby letting you parameterize clients with different requests, queue or log requests, and ***support undoable operations***.

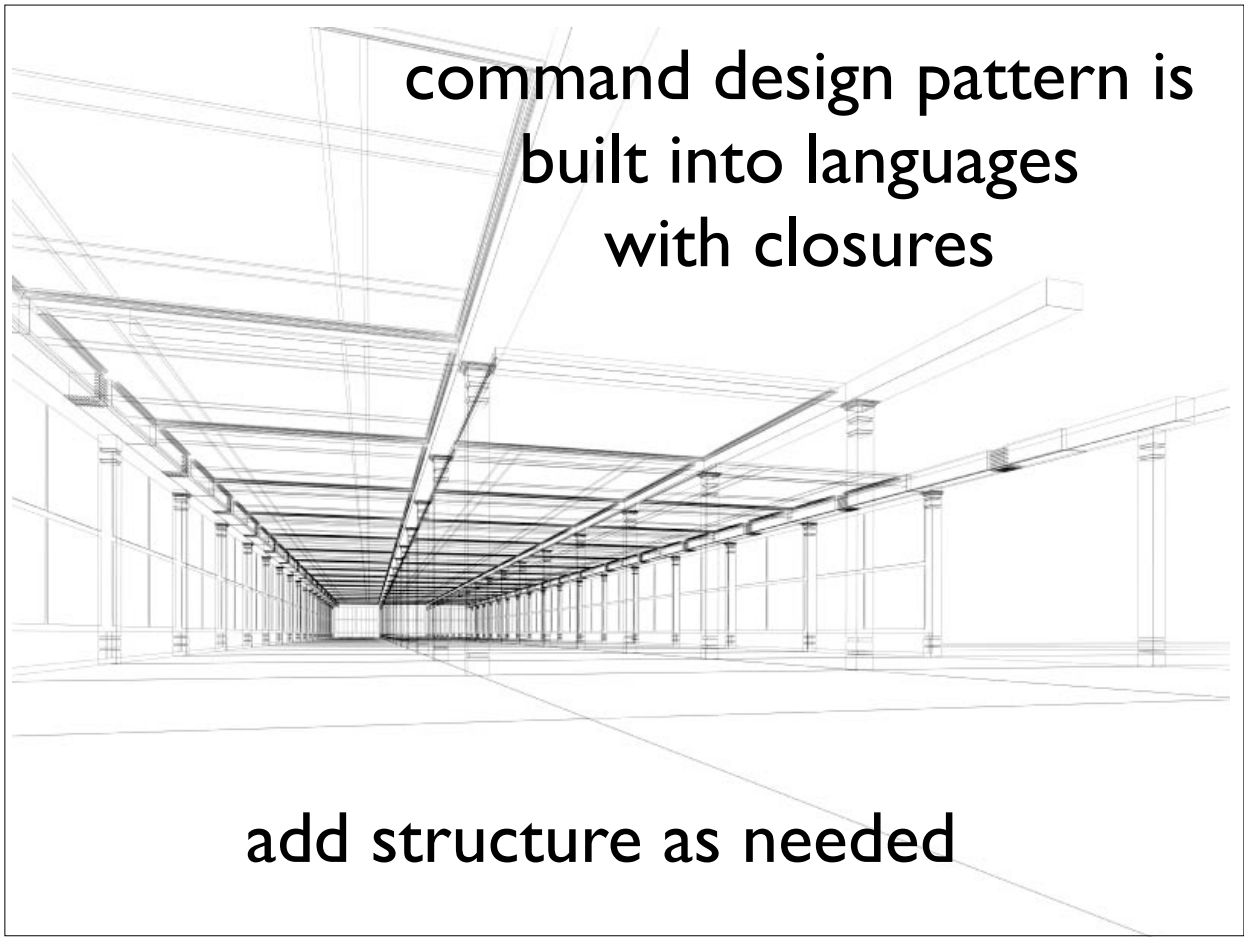
```ruby
class Command
    def initialize(doit, undoit)
        @do = doit
        @undo = undoit
    end

    def do_command
        @do.call
    end

    def undo_command
        @undo.call
    end
end
```

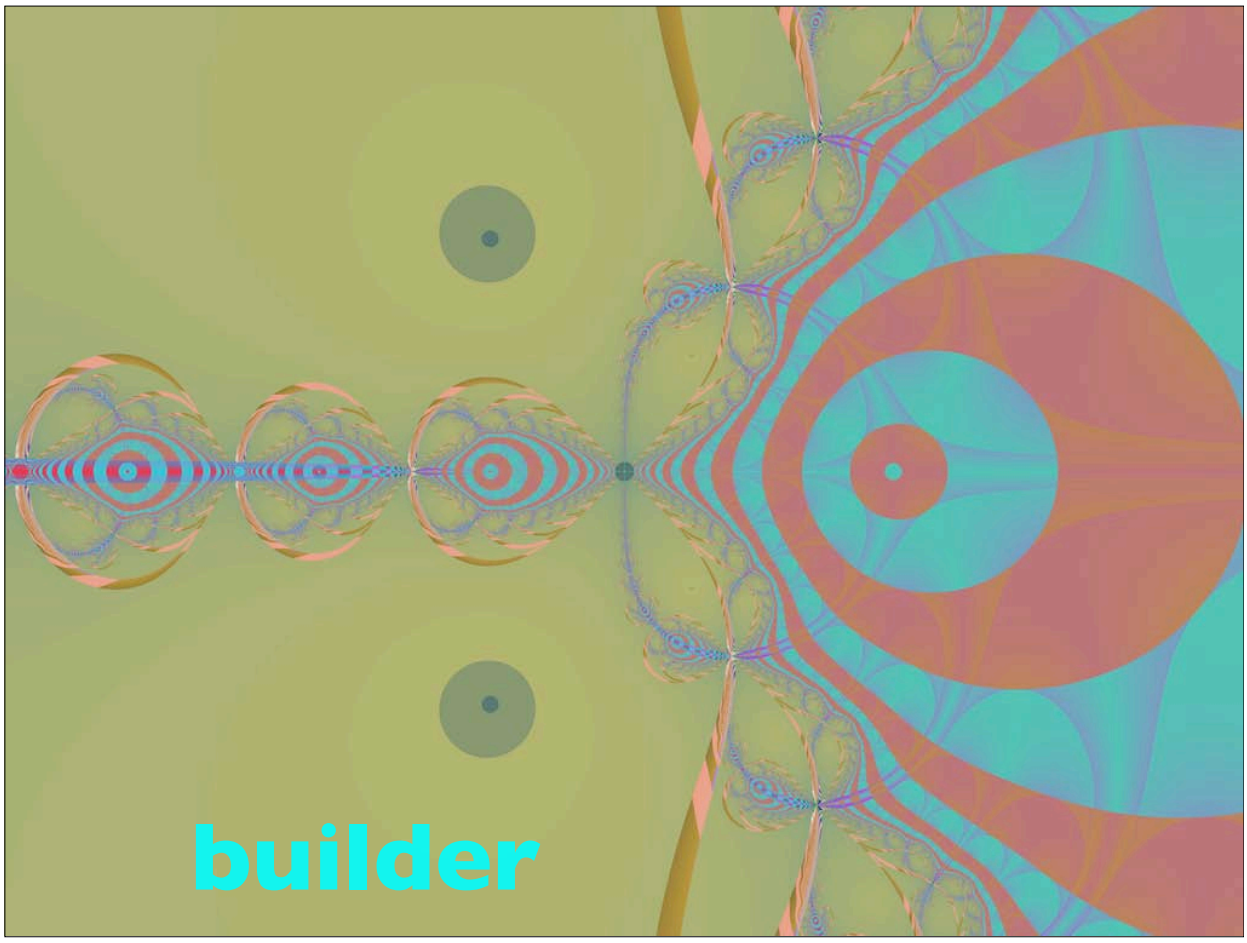
```ruby
def test_command_class
  count = 0
  commands = []
  (1..10).each do |i|
      commands << Command.new(
          proc { count += 1 }, proc { count -= 1 } )
  end

  assert_equal(0, count)
  commands.each { |cmd| cmd.do_command }
  assert_equal(10, count)
  commands.each { |cmd| cmd.undo_command}
  assert_equal(0, count)
end
```

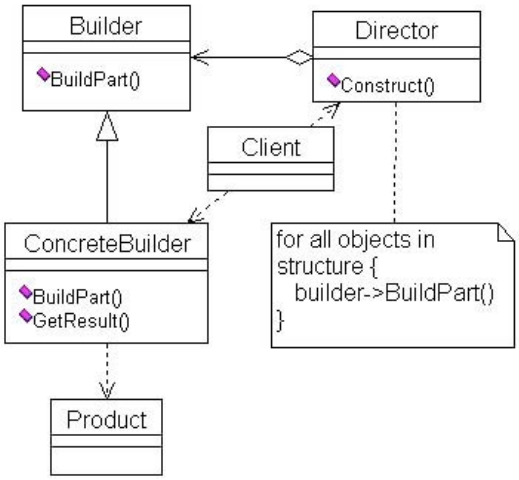


Execution in the Kingdom of Nouns

steve yegge


command design pattern is
built into languages
with closures
add structure as needed


builder



Separate the construction of a complex object from its representation so that the same construction process can create different representations.

“traditional” builder

```ruby
class Computer
  attr_accessor :display, :motherboard, :drives

  def initialize(display=:crt, motherboard=Motherboard.new, drives=[])
    @motherboard = motherboard
    @drives = drives
    @display = display
  end

end

class CPU
  # CPU stuff
end

class BasicCPU < CPU
  # not very fast CPU stuff
end

class TurboCPU < CPU
  # very fast CPU stuff
end
```

```ruby
class Motherboard
  attr_accessor :cpu, :memory_size

  def initialize(cpu=BasicCPU.new, memory_size=1000)
    @cpu = cpu
    @memory_size = memory_size
  end
end

class Drive
  attr_reader :type, :size, :writable

  def initialize(type, size, writable)
    @type = type
    @size = size
    @writable = writable
  end
end
```

```ruby
class ComputerBuilder
  attr_reader :computer

  def initialize
    @computer = Computer.new
  end

  def turbo(has_turbo_cpu=true)
    @computer.motherboard.cpu = TurboCPU.new
  end

  def display=(display)
    @computer.display = display
  end

  def memory_size=(size_in_mb)
    @computer.motherboard.memory_size = size_in_mb
  end

  def add_cd(writer=false)
    @computer.drives << Drive.new(:cd, 760, writer)
  end
```

```ruby
def test_builder
  b = ComputerBuilder.new
  b.turbo
  b.add_cd(true)
  b.add_dvd
  b.add_hard_disk(100000)
  computer = b.computer
  assert computer.motherboard.cpu.is_a? TurboCPU
  assert computer.drives.size == 3
end
```

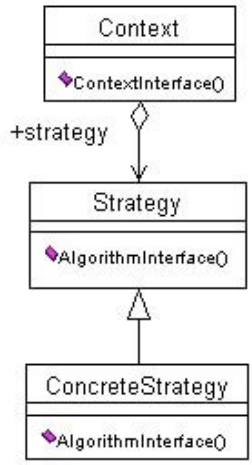
add dynamic behavior: ad hoc combinations

```
def test_synthetic_method
  b = ComputerBuilder.new
  b.add_turbo_and_dvd_and_harddisk
  assert b.computer.motherboard.cpu.is_a? TurboCPU
  assert b.computer.drives.size == 2
end
```

in computer_builder:

```
def method_missing(name, *args)
  words = name.to_s.split("_")
  return super(name, *args) unless words.shift == 'add'
  words.each do |word|
    next if word == 'and'
    add_cd if word == 'cd'
    add_dvd if word == 'dvd'
    add_hard_disk(100000) if word == 'harddisk'
    turbo if word == 'turbo'
  end
end
```

```
def test_synthetic_method
  b = ComputerBuilder.new
  b.add_turbo_and_dvd_and_harddisk
  assert b.computer.motherboard.cpu.is_a? TurboCPU
  assert b.computer.drives.size == 2
end
```



Define a family of algorithms, encapsulate each one, and make them interchangeable. Strategy lets the algorithm vary independently from clients that use it.

“traditional” strategy

```ruby
module Strategy
  def execute; end
end


class CalcByMult
  include Strategy

  def execute(n, m)
   n * m
  end
end
```

```ruby
class CalcByAdds
  include Strategy

  def execute(n, m)
    result = 0
    n.times do
      result += m
    end
    result
  end
end
```

```ruby
class TestStrategyMult < Test::Unit::TestCase
  def setup
    @data = [
      [3, 4, 12],
      [5, -5, -25]
    ]
  end

def test_as_strategies
  [CalcByMult.new, CalcByAdds.new].each do |s|
    @data.each do |l|
      assert_equal(l[2], s.execute(l[0], l[1]))
    end
  end
end
```

better strategy for strategy

what if **execute** was **call** instead?

ruby already has a mechanism for passing around executable code

combination of the command & strategy patterns

```
class MultStrategies
  attr_reader :strategies

  def initialize()
     @strategies = [
       proc { |n, m| n * m}
     ]
  end

  def add_strategy(&block)
    @strategies << block
  end
end
```

```ruby
def test_adding_strategy
  s = MultStrategies.new
  s.add_strategy do |n, m|
    result = 0
    n.times { result += m }
    result
  end
  s.strategies.each do |s|
    @data.each do |l|
      assert_equal(l[2], s.call(l[0], l[1]))
    end
  end
end
```

another strategy

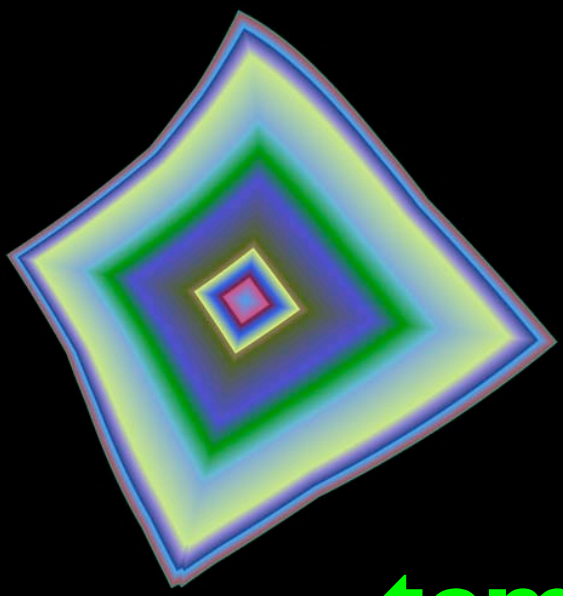
dynamically applying the proper module based on file types for image processing

```ruby
open(image_file) do |in|
  case identify_image_format(in)
  when "JPG"
    in.extend(JPGMethods) # readframe, readsof
  when "TIFF"
    in.extend(TIFFMethods) # readlong, readdirent
  end
end
```

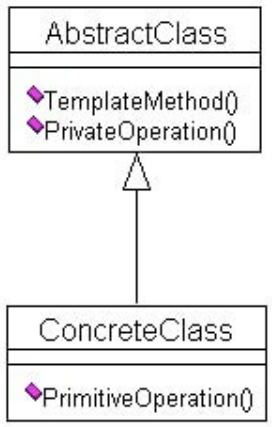
blatantly stolen from glenn vanderburg,
and all he got was this lousy acknowledgement

mixins are a great way to impose strategies because they can contain behavior

ummmmm, sprinkles



template



Define the skeleton of an algorithm in an operation, deferring some steps to subclasses. Template Method lets subclasses redefine certain steps of an algorithm without changing the algorithm's structure.

```ruby
class Customer
  attr_accessor :plan

  def initialize
    @plan = []
  end

  def check_credit
    raise "Must override this method"
  end

  def check_inventory
    raise "Must override this method"
  end

  def ship
    raise "Must override this method"
  end

  def process
    check_credit
    check_inventory
    ship
  end
end
```

```ruby
class UsCustomer < Customer
   def check_credit
     plan << "checking US customer credit"
   end

   def check_inventory
     plan << "checking US warehouses"
   end

   def ship
     plan << "Shipping to US address"
   end
end
```

```ruby
class EuropeanCustomer < Customer
  def check_credit
    plan << "checking European customer credit"
  end

  def check_inventory
    plan << "checking European warehouses"
  end

  def ship
    plan << "Shipping to European address"
  end

end
```

```ruby
class TestTemplate < Test::Unit::TestCase

  def test_template_methods_throw_exceptions_when_not_defined
    c = Customer.new
    assert_raise(RuntimeError) { c.check_credit }
    assert_raise(RuntimeError) { c.check_inventory }
    assert_raise(RuntimeError) { c.ship }
  end

  def test_customer
    c = UsCustomer.new
    c.process
    assert_equal c.plan[0], "checking US customer credit"
    assert_equal c.plan[1], "checking US warehouses"
    assert_equal c.plan[2], "Shipping to US address"
    e = EuropeanCustomer.new
    e.process
    assert_equal e.plan[0], "checking European customer credit"
    assert_equal e.plan[1], "checking European warehouses"
    assert_equal e.plan[2], "Shipping to European address"
  end
end
```

```ruby
class UsCustomer < Customer
   def initialize
     super
     @check_credit = lambda { plan << "checking US customer credit"}
     @check_inventory = lambda { plan << "checking US warehouses"}
     @ship = lambda { plan << "Shipping to US address"}
   end
end
```

```ruby
def test_customer_derivative
  c = UsCustomer.new
  c.process
  assert_equal c.plan[0], "checking US customer credit"
  assert_equal c.plan[1], "checking US warehouses"
  assert_equal c.plan[2], "Shipping to US address"
end
```

why abstract methods?

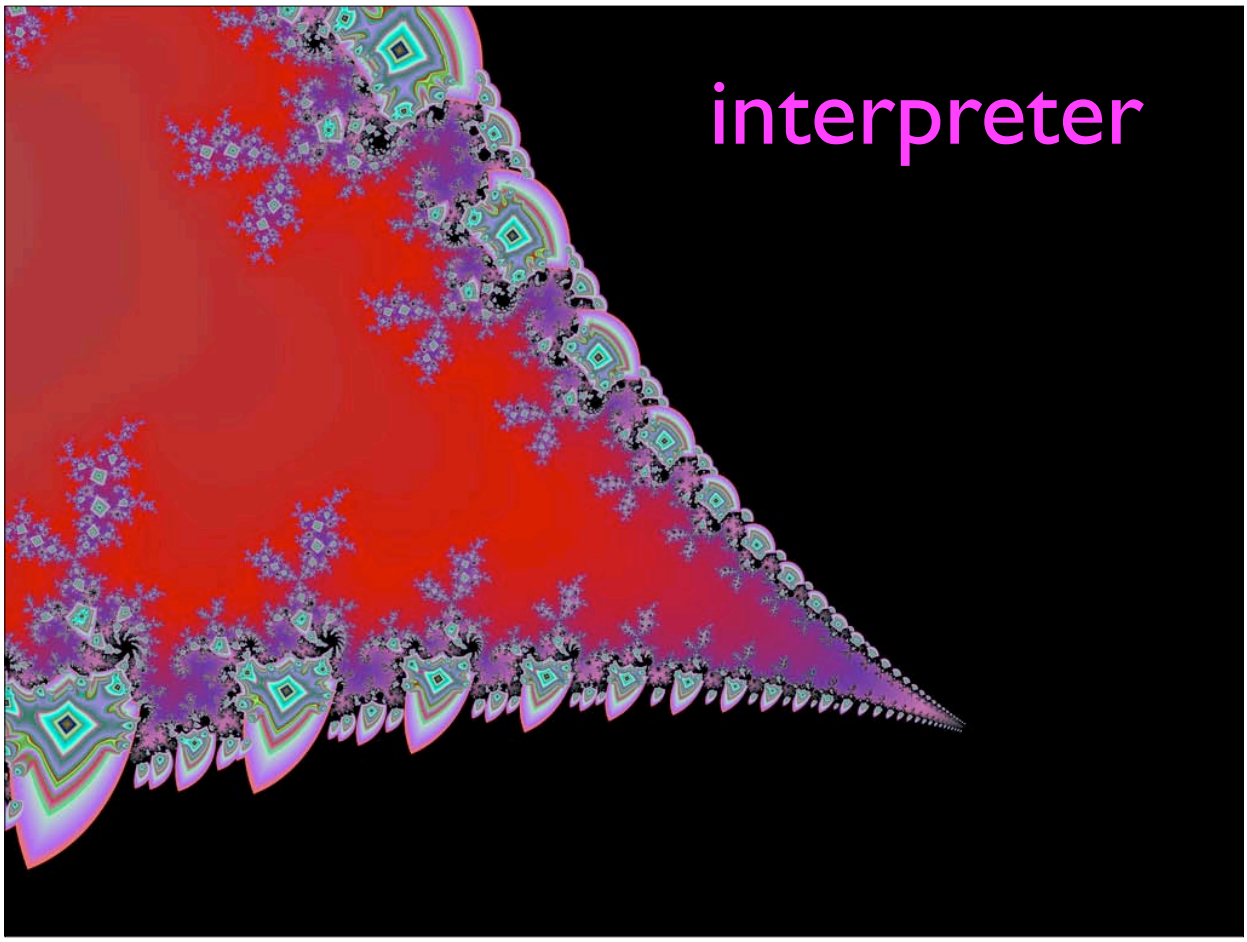
```ruby
class Customer
  attr_accessor :plan, :check_credit, :check_inventory, :ship

  def initialize
    @plan = []
  end

  def process
    @check_credit.call
    @check_inventory.call
    @ship.call
  end
end
```

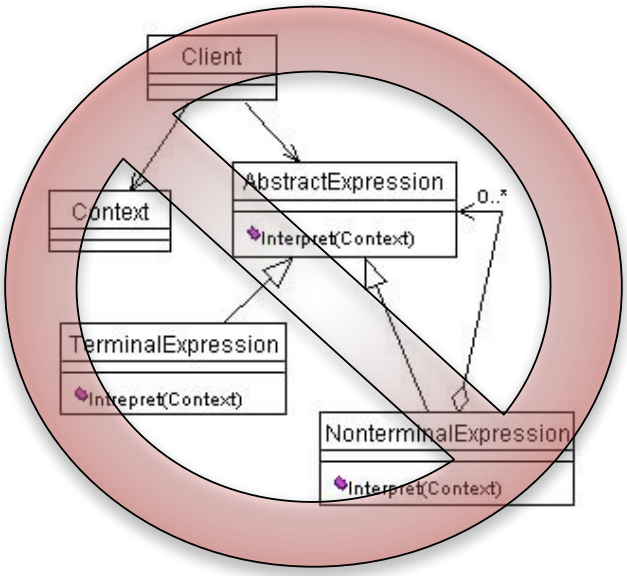
```ruby
class CustomerWithOptionalTemplates
  attr_accessor :plan, :check_credit, :check_inventory, :ship

  def initialize
    @plan = []
  end

  def process
    @check_credit.call unless @check_credit.nil?
    @check_inventory.call unless @check_inventory.nil?
    @ship.call unless @ship.nil?
  end
end
```

```ruby
class UsCustomerOptional < CustomerWithOptionalTemplates
   def initialize
     super
     @check_credit = lambda { plan << "checking US customer credit"}
     @ship = lambda { plan << "Shipping to US address"}
   end
end
```

```ruby
def test_customer_with_optional_templates
  c = UsCustomerOptional.new
  c.process
  assert_equal c.plan[0], "checking US customer credit"
  assert_equal c.plan[1], "Shipping to US address"
end
```

```ruby
class CustomerWithOptionalTemplates
  attr_accessor :plan, :check_credit, :check_inventory, :ship

  def initialize
    @plan = []
  end

  def process
    @check_credit.call unless @check_credit.nil?
    @check_inventory.call unless @check_inventory.nil?
    @ship.call unless @ship.nil?
  end

  def process_succinct
    [@check_credit, @check_inventory, @ship].each do |p|
      p.call unless p.nil?
    end
  end
end
```



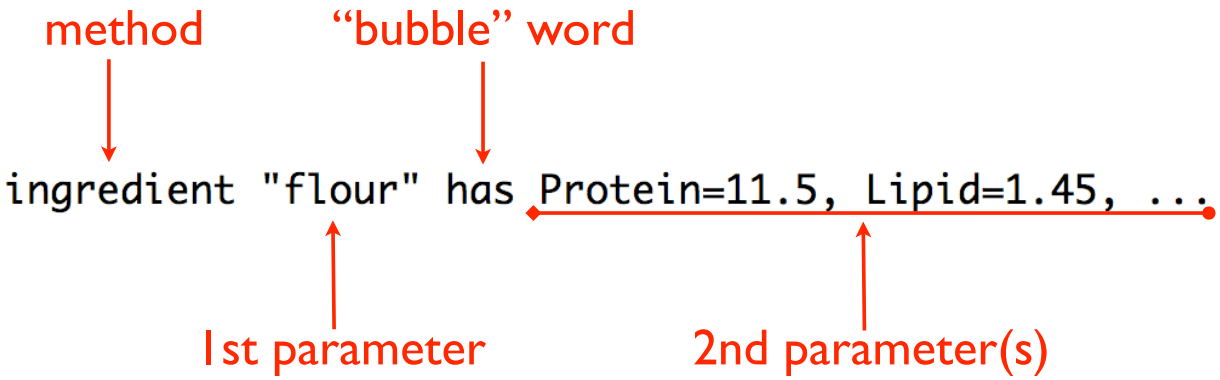


Given a language, define a representation for its grammar along with an interpreter that uses the representation to interpret sentences in the language.

building domain specific languages

```
ingredient "flour" has Protein=11.5, Lipid=1.45, Sugars=1.12, Calcium=20, Sodium=0
ingredient "nutmeg" has Protein=5.84, Lipid=36.31, Sugars=28.49, Calcium=184, Sodium=16
ingredient "milk" has Protein=3.22, Lipid=3.25, Sugars=5.26, Calcium=113, Sodium=40


class NutritionProfile
  attr_accessor :name, :protein, :lipid, :sugars, :calcium, :sodium

  def initialize(name, protein=0, lipid=0, sugars=0, calcium=0, sodium=0)
    @name = name
    @protein, @lipid, @sugars =  protein, lipid, sugars
    @calcium, @sodium = calcium, sodium
  end

  def self.create_from_hash(name, h)
    new(name, h['protein'], h['lipid'], h['sugars'], h['calcium'], h['sodium'])
  end

  def to_s()
    "\tProtein: " +   @protein.to_s       +
    "\n\tLipid: " +   @lipid.to_s         +
    "\n\tSugars: " +  @sugars.to_s        +
    "\n\tCalcium: " + @calcium.to_s       +
    "\n\tSodium: " +  @sodium.to_s
  end

end
```

what is this?



```ruby
class NutritionProfileDefinition
  class << self
    def const_missing(sym)
      sym.to_s.downcase
    end
  end

  def ingredient(name, ingredients)
    NutritionProfile.create_from_hash name, ingredients
  end

  def process_definition(definition)
    t = polish_text(definition)
    instance_eval polish_text(definition)
  end

  def polish_text(definition_line)
    polished_text = definition_line.clone
    polished_text.gsub!(/=/, '=>')
    polished_text.sub!(/and /, '')
    polished_text.sub!(/has /, ',')
    polished_text
  end

end
```

```ruby
def test_polish_text
  test_text = "ingredient \"flour\" has Protein=11.5, Lipid=1.45, Sugars=1.12, Calcium=20, and Sodium=0"
  expected = 'ingredient "flour" ,Protein=>11.5, Lipid=>1.45, Sugars=>1.12, Calcium=>20, Sodium=>0'
  assert_equal expected, NutritionProfileDefinition.new.polish_text(test_text)
end
```

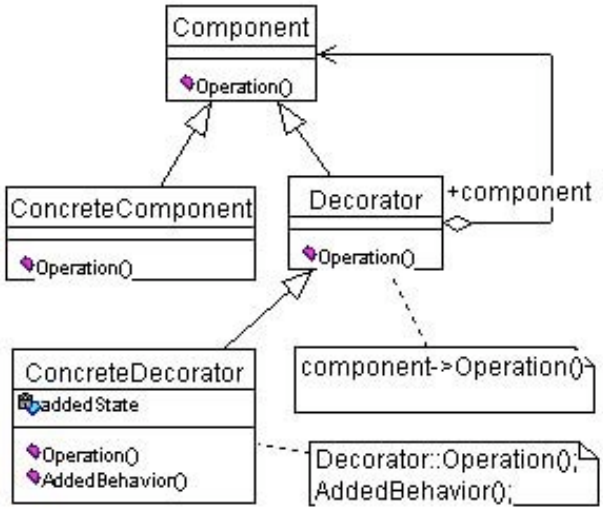
```ruby
def polish_text(definition_line)
  polished_text = definition_line.clone
  polished_text.gsub!(/=/, '=>')
  polished_text.sub!(/and /, '')
  polished_text.sub!(/has /, ',')
  polished_text
end
```

```ruby
def process_definition(definition)
  instance_eval polish_text(definition)
end
```

```
'ingredient "flour" ,Protein=>11.5, Lipid=>1.45,
```

```ruby
def ingredient(name, ingredients)
  NutritionProfile.create_from_hash name, ingredients
end
```

internal dsl's == embedded interpreter



Attach additional responsibilities to an object dynamically. Decorators provide a flexible alternative to subclassing for extending functionality.

```ruby
module Decorator
  def initialize(decorated)
    @decorated = decorated
  end

  def method_missing(method, *args)
    args.empty? ?
      @decorated.send(method) :
      @decorated.send(method, args)
  end
end
```

```ruby
class Coffee
  def cost
    2
  end
end
```

```ruby
class Milk
  include Decorator

  def cost
    @decorated.cost + 0.4
  end
end
```

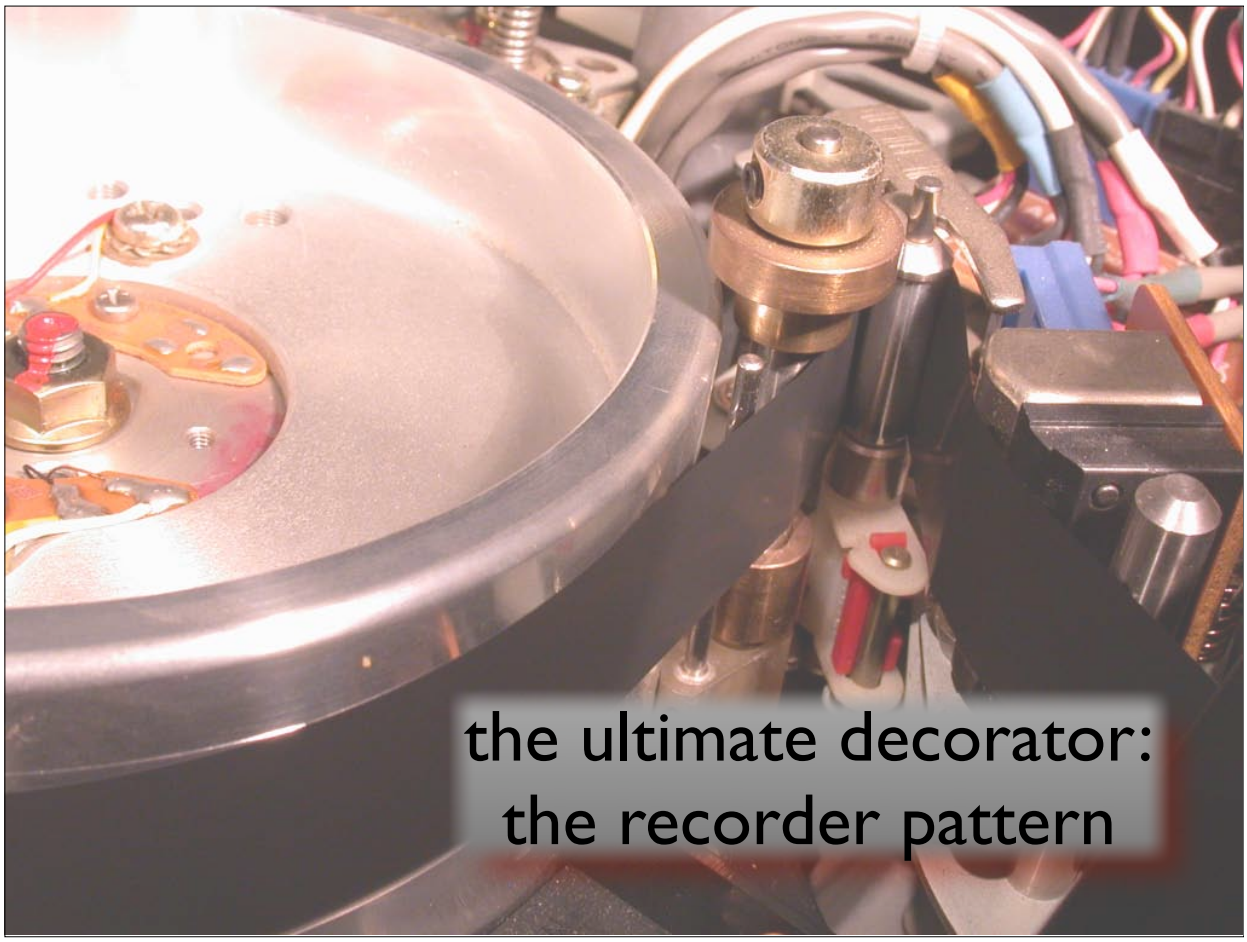
```ruby
class Whip
  include Decorator

  def cost
    @decorated.cost + 0.2
  end
end
```

```ruby
class Sprinkles
  include Decorator

  def cost
    @decorated.cost + 0.3
  end
end
```

```ruby
def test_that_decoration_works
  assert_equal 2.2,
    Whip.new(Coffee.new).cost
  assert_equal 2.9,
    Sprinkles.new(Whip.new(Milk.new(Coffee.new))).cost
end
```

```ruby
module Whipped
  def cost
    super + 0.2
  end
end

module Sprinkles
  def cost
    super + 0.3
  end
end

class Coffee
  def self.with(*args)
    args.inject(self.new) {|memo, val| memo.extend val}
  end

  def cost
    2
  end
end
```

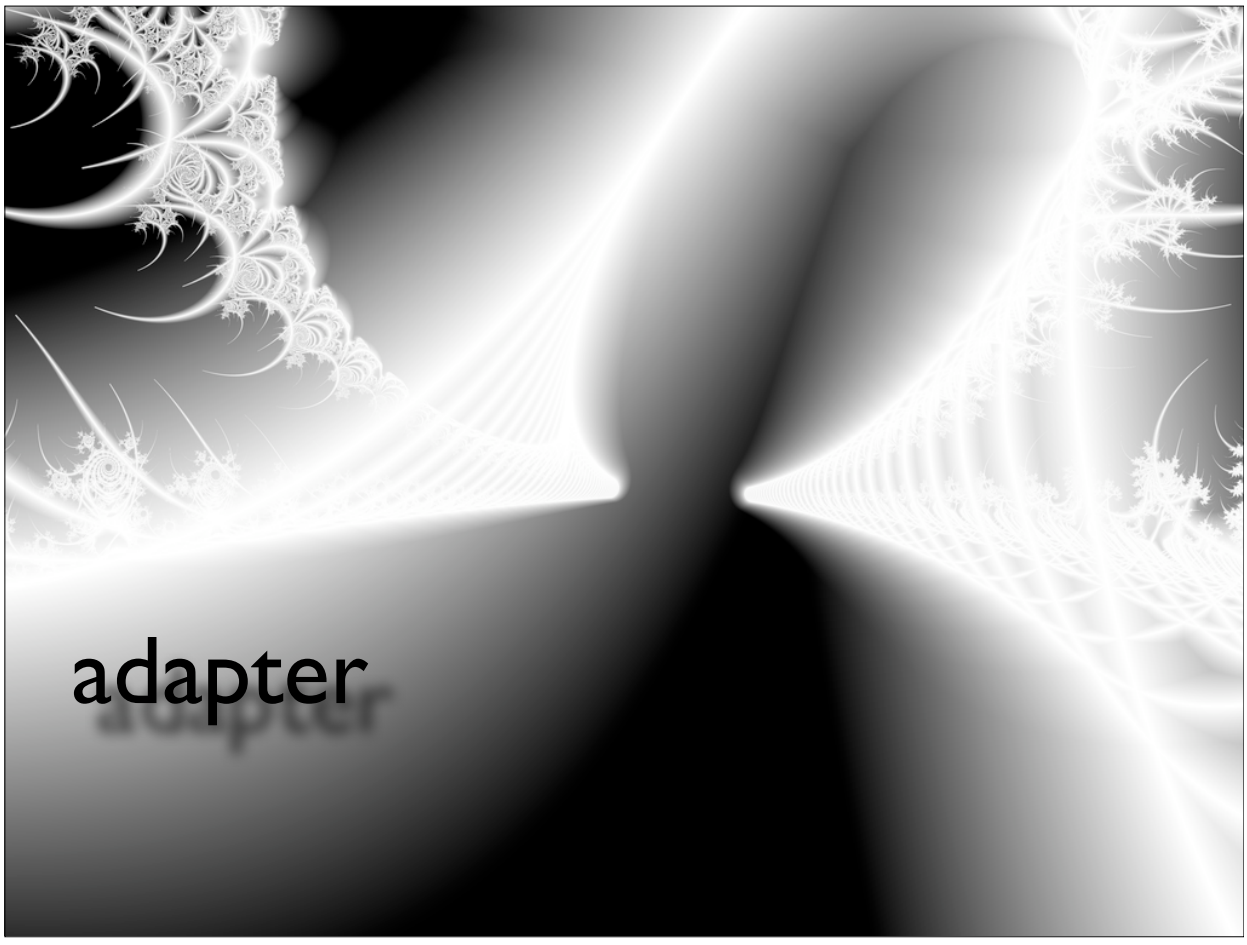
```
def test_decorator_works_via_inject
  x = Coffee.with Sprinkles, Whipped
  assert_equal 2.5, x.cost
end
```

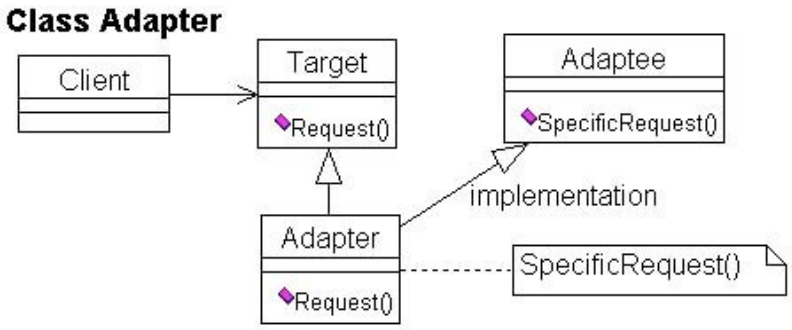


```ruby
def test_recorder
  r = Recorder.new
  r.sub!(/Java/) { "Ruby" }
  r.upcase!
  r[11, 5] = "Universe"
  r << "!"

  s = "Hello Java World"
  r.play_back_to(s)
  assert_equal "HELLO RUBY Universe!", s
end
```

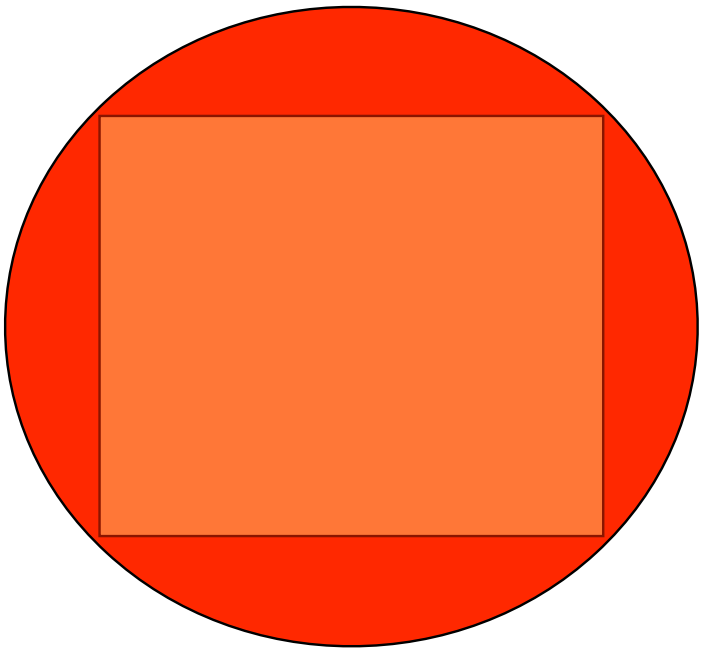
```ruby
class Recorder
  def initialize
    @messages = []
  end

  def method_missing(method, *args, &block)
    @messages << [method, args, block]
  end

  def play_back_to(obj)
    @messages.each do |method, args, block|
      obj.send(method, *args, &block)
    end
  end
end
```

```ruby
def test_recorder
  r = Recorder.new
  r.sub!(/Java/) { "Ruby" }
  r.upcase!
  r[11, 5] = "Universe"
  r << "!"

  s = "Hello Java World"
  r.play_back_to(s)
  assert_equal "HELLO RUBY Universe!", s
end
```





Convert the interface of a class into another interface clients expect. Adapter lets classes work together that couldn't otherwise because of incompatible interfaces.



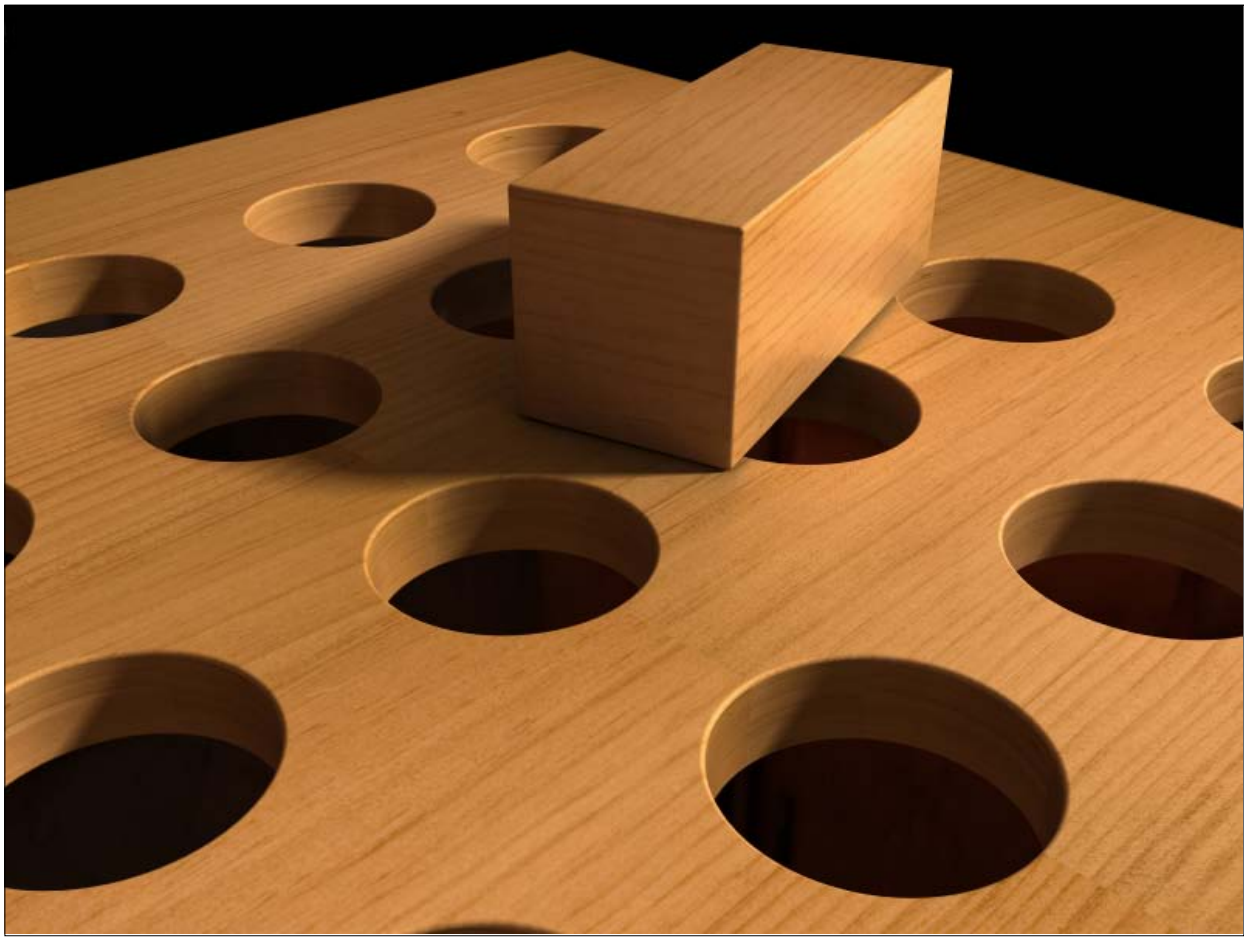
step 1: "normal" adaptor

```ruby
class SquarePeg
    attr_reader :width

    def initialize(width)
        @width = width
    end
end

class RoundPeg
    attr_reader :radius

    def initialize(radius)
        @radius = radius
    end
end
```

```ruby
class RoundHole
    attr_reader :radius

    def initialize(r)
        @radius = r
    end

    def peg_fits?( peg )
        peg.radius <= radius
    end
end
```

```ruby
class SquarePegAdaptor
    def initialize(square_peg)
        @peg = square_peg
    end

    def radius
        Math.sqrt(((@peg.width/2) ** 2)*2)
    end
end
```

```ruby
def test_pegs
  hole = RoundHole.new(4.0)
  4.upto(7) do |i|
      peg = SquarePegAdaptor.new(SquarePeg.new(i))
      if (i < 6)
        assert hole.peg_fits?(peg)
      else
        assert ! hole.peg_fits?(peg)
      end
  end
end
```



why bother with extra adaptor class?

```
class SquarePeg
    def radius
        Math.sqrt( ((width/2) ** 2) * 2 )
    end
end
```

what if open class added adaptor methods clash with existing methods?

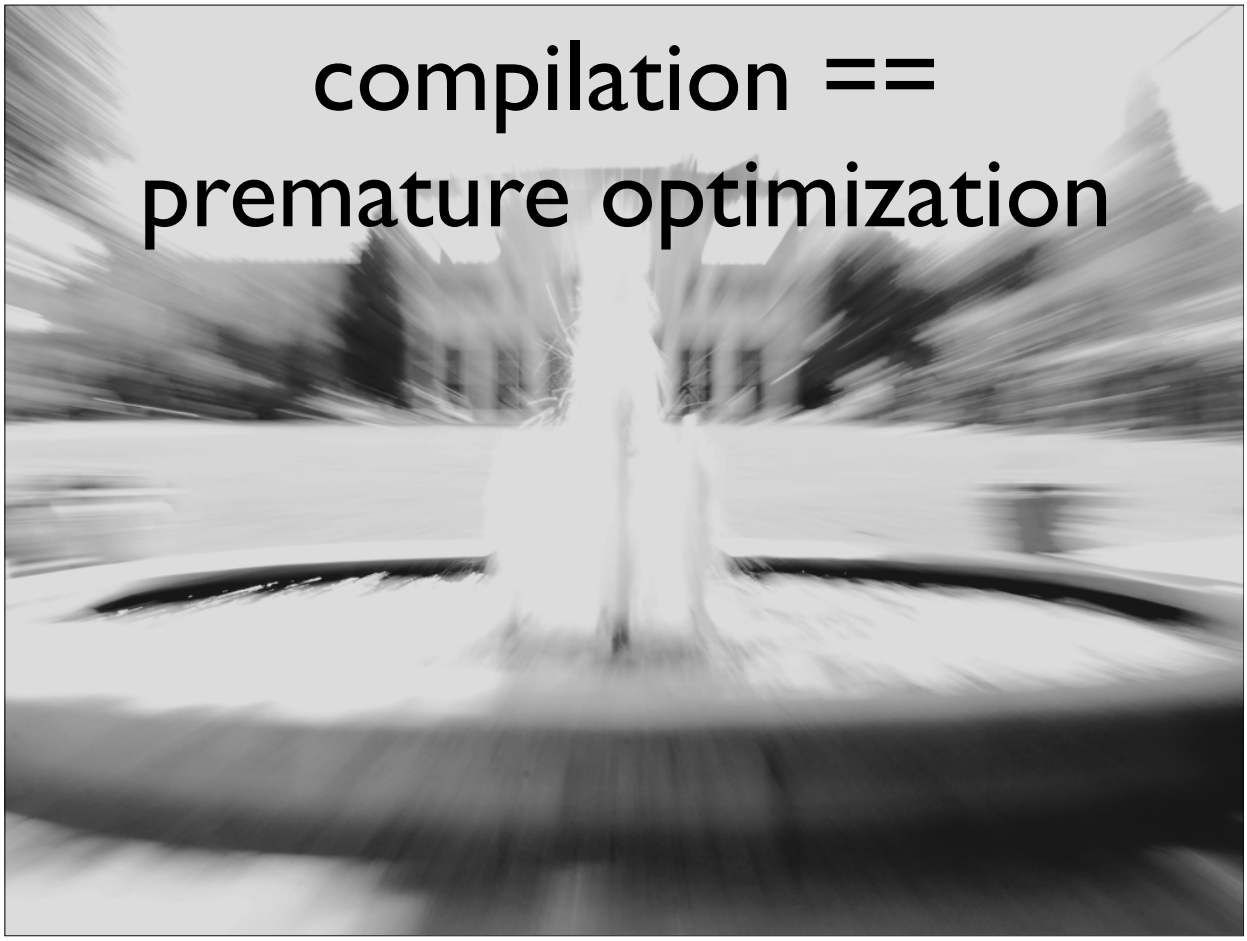
```ruby
class SquarePeg
  include InterfaceSwitching

  def radius
    @width
  end

  def_interface :square, :radius

  def radius
    Math.sqrt(((@width/2) ** 2) * 2)
  end

  def_interface :holes, :radius

  def initialize(width)
    set_interface :square
    @width = width
  end
end
```

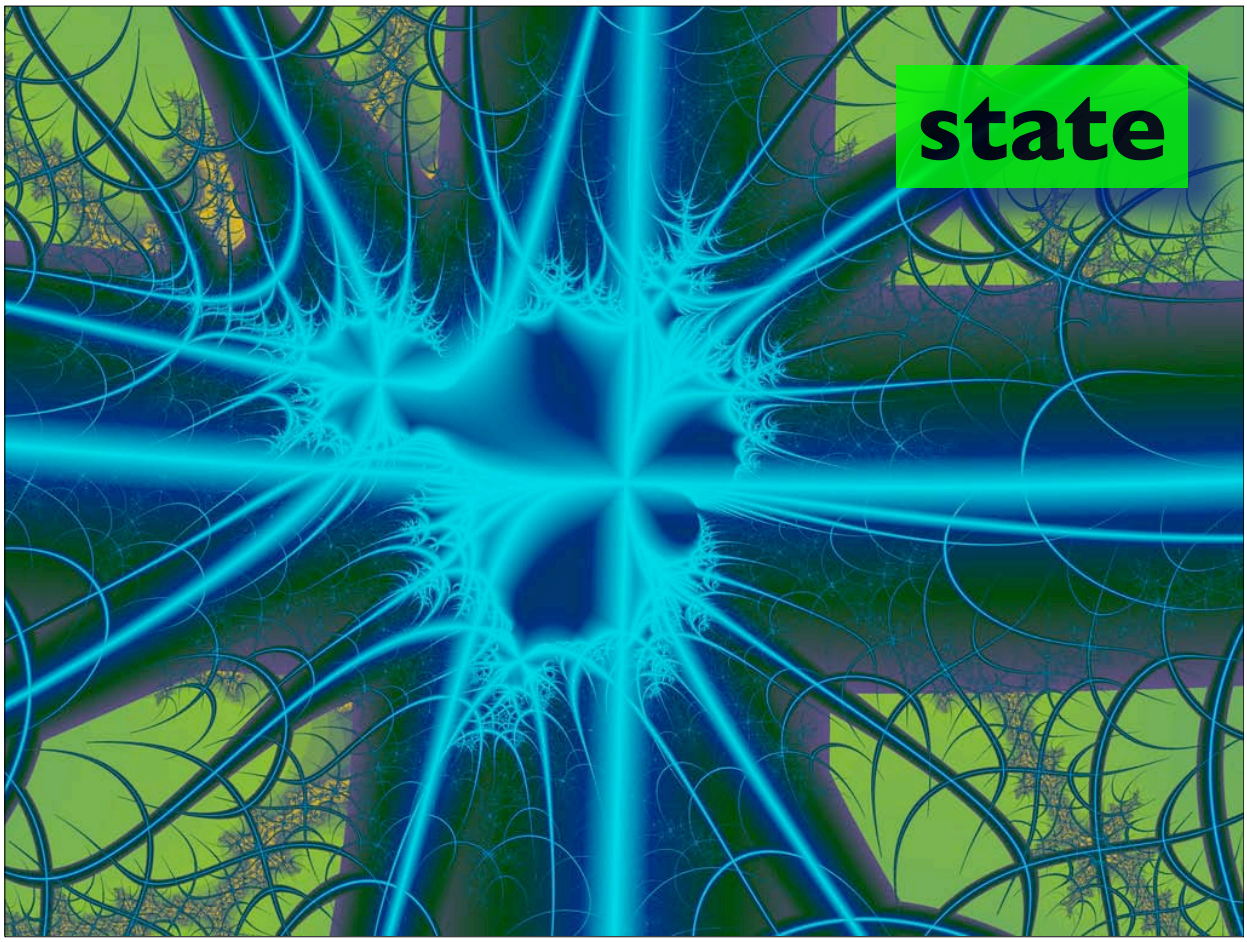
```ruby
def test_pegs_switching
  hole = RoundHole.new( 4.0 )
  4.upto(7) do |i|
    peg = SquarePeg.new(i)
    peg.with_interface(:holes) do
      if (i < 6)
        assert hole.peg_fits?(peg)
      else
        assert ! hole.peg_fits?(peg)
      end
    end
  end
end
```

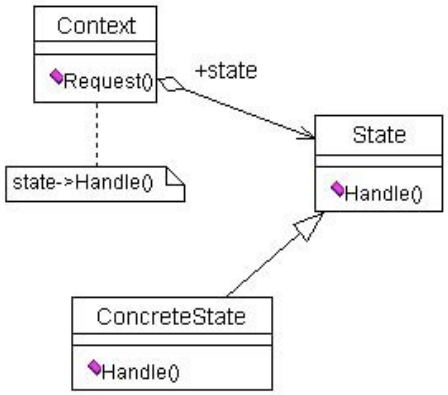
interface helper

```ruby
class Class
  def def_interface(interface, *syms)
    @__interface__ ||= {}
    a = (@__interface__[interface] ||= [])
    syms.each do |s|
      a << s unless a.include? s
      alias_method "__#{s}_#{interface}__".intern, s
      remove_method s
    end
  end
end
```

```ruby
module InterfaceSwitching
  def set_interface(interface)
    unless self.class.instance_eval{ @__interface__[interface] }
      raise "Interface for #{self.inspect} not understood."
    end
    i_hash = self.class.instance_eval "@__interface__[interface]"
    i_hash.each do |meth|
      class << self; self end.class_eval <<-EOF
        def #{meth}(*args,&block)
                send(:__#{meth}_#{interface}__, *args, &block)
        end
      EOF
    end
    @__interface__ = interface
  end

  def with_interface(interface)
    oldinterface = @__interface__
    set_interface(interface)
    begin
      yield self
    ensure
      set_interface(oldinterface)
    end
  end
end
```


compilation ==
premature optimization


state



Allow an object to alter its behavior when its internal state changes. The object will appear to change its class.

mixology?

a gem developed during thoughtworks project work by:
Pat Farley, anonymous z, Dan Manges, Clint Bishop

ruby allows you to mix-in behavior

mixology allows you to easily unmix behavior

state pattern on steroids

```ruby
class Door

  def initialize(open = false)
    if open
      extend Open
    else
      extend Closed
    end

    def closed?
      kind_of? Closed
    end

    def opened?
      kind_of? Open
    end

  end
```

```ruby
module Closed
  def knock
    puts "knock, knock"
  end

  def open
    extend Open
  end
end

module Open
  def knock
    raise "just come on in"
  end

  def close
    extend Closed
  end
 end
end
```

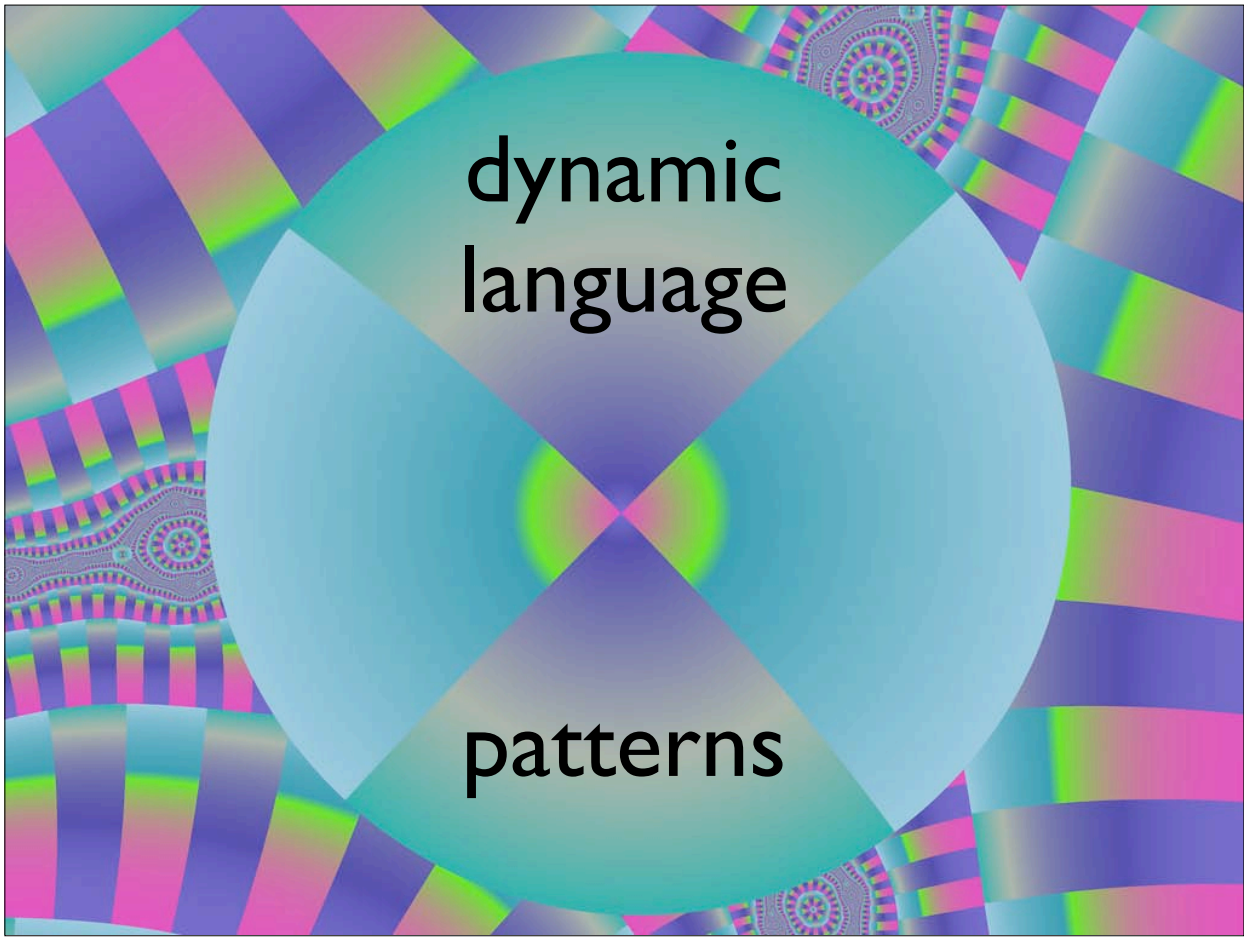
```ruby
class DoorTest < Test::Unit::TestCase
  def test_an_open_door_is_opened_and_not_closed
    door = Door.new :open
    assert door.opened?
    assert !door.closed?
  end

  def test_a_closed_door_is_closed_and_not_opened
    door = Door.new
    assert door.closed?
    assert !door.opened?
  end

  def test_closing_an_open_door_makes_the_door_closed_but_not_opened
    door = Door.new :open
    door.close
    assert door.closed?
    assert !door.opened?
  end

  def test_opening_a_closed_door_makes_the_door_opened_but_not_closed
    door = Door.new
    door.open
    assert door.opened?
    assert !door.closed?
  end
end
```

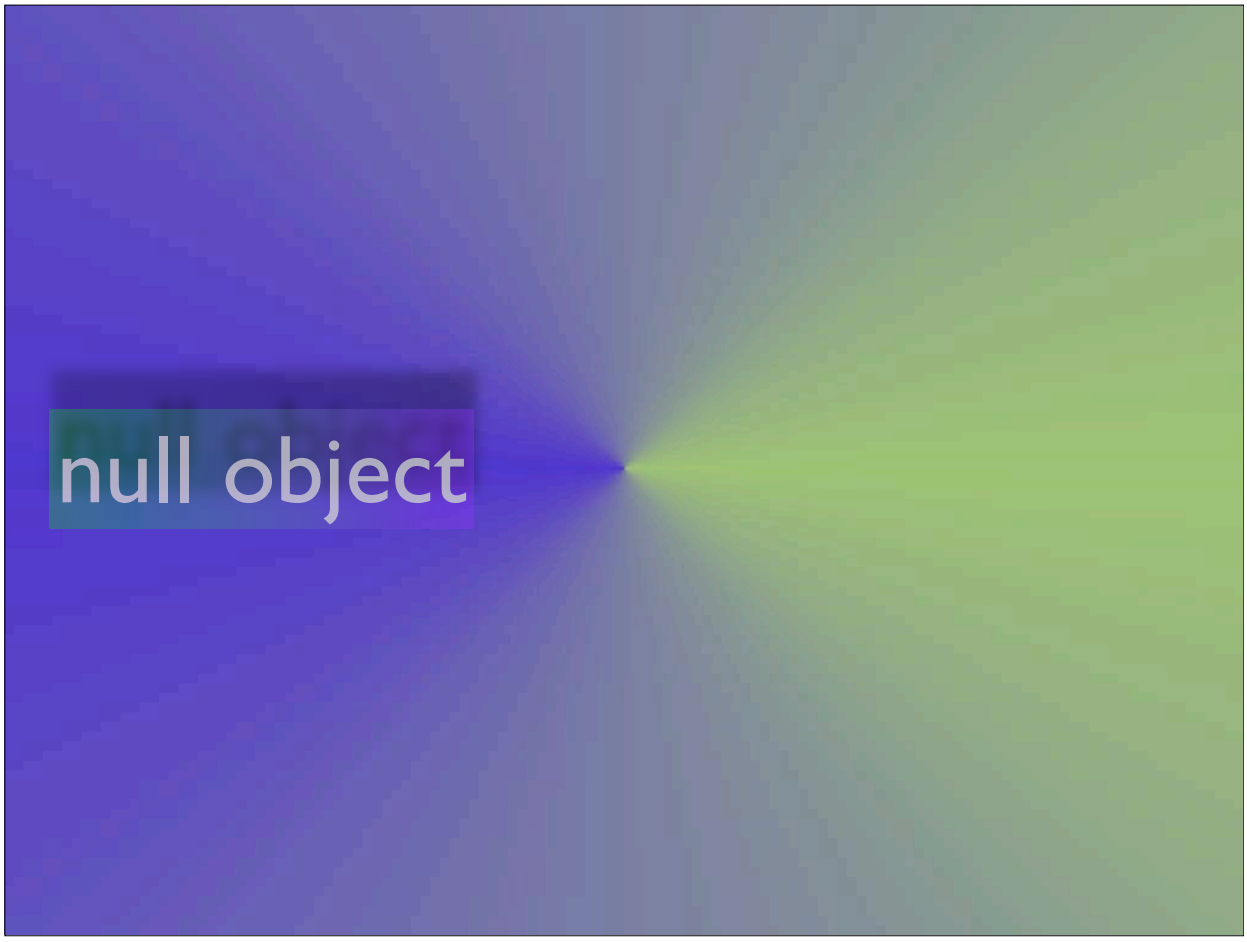
```
Loaded suite door
Started
..FF
Finished in 0.006623 seconds.

  1) Failure:
test_closing_an_open_door_makes_the_door_closed_but_not_opened(DoorTest)
[door.rb:67]:
 is not true.

  2) Failure:
test_opening_a_closed_door_makes_the_door_opened_but_not_closed(DoorTest)
[door.rb:74]:
 is not true.

4 tests, 8 assertions, 2 failures, 0 errors
```

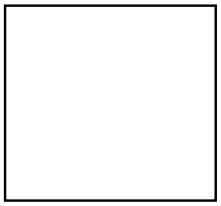
state transitions fail because the old mixin is still mixed in

```ruby
class Door
  def initialize(open = false)
    @open = open
    if open
      mixin Open
    else
      mixin Closed
    end

    def closed?
      kind_of? Closed
    end

    def opened?
      kind_of? Open
    end
  end
```

```ruby
module Closed
  def open
    unmix Closed
    mixin Open
  end
end

module Open
  def close
    unmix Open
    mixin Closed
  end
end
end
```


dynamic
language
patterns


null object



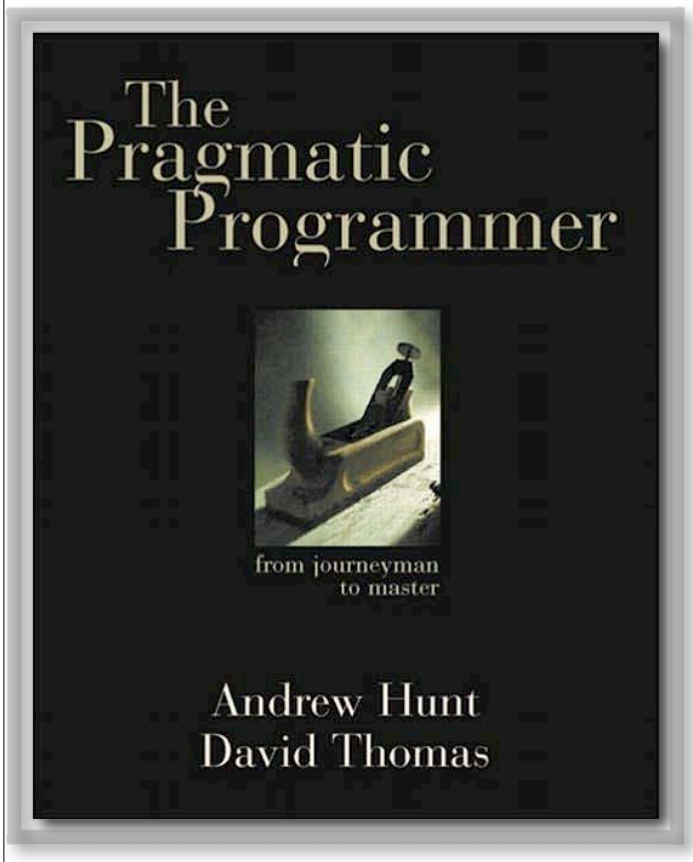
The null object pattern uses a special object representing null, instead of using an actual null. The result of using the null object should semantically be equivalent to doing nothing.

this pattern doesn't
exist in ruby

NilClass is already defined

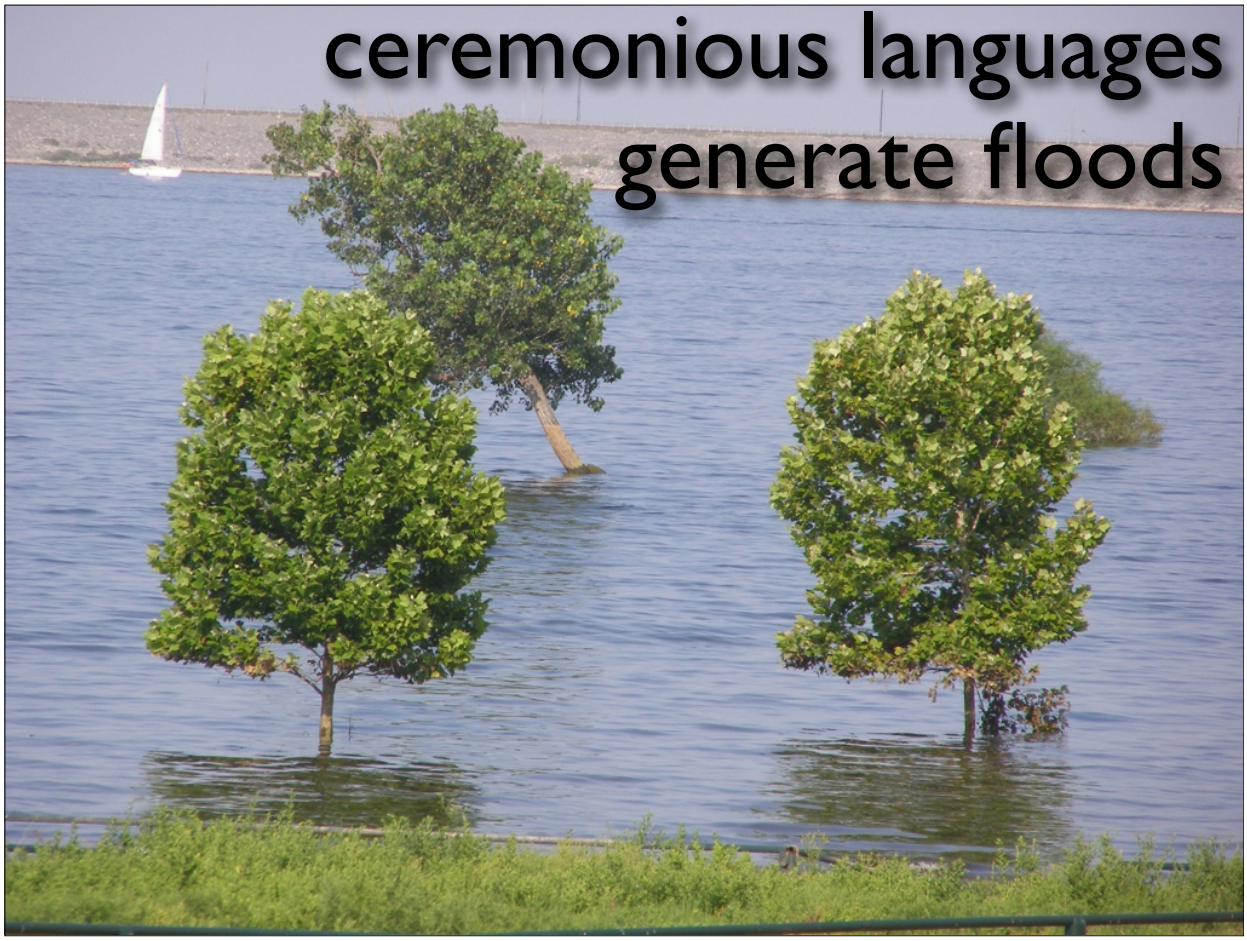
```ruby
class CustomerWithOptionalTemplates
  attr_accessor :plan, :check_credit, :check_inventory, :ship

  def initialize
    @plan = []
  end

  def process
    @check_credit.call unless @check_credit.nil?
    @check_inventory.call unless @check_inventory.nil?
    @ship.call unless @ship.nil?
  end

end
```

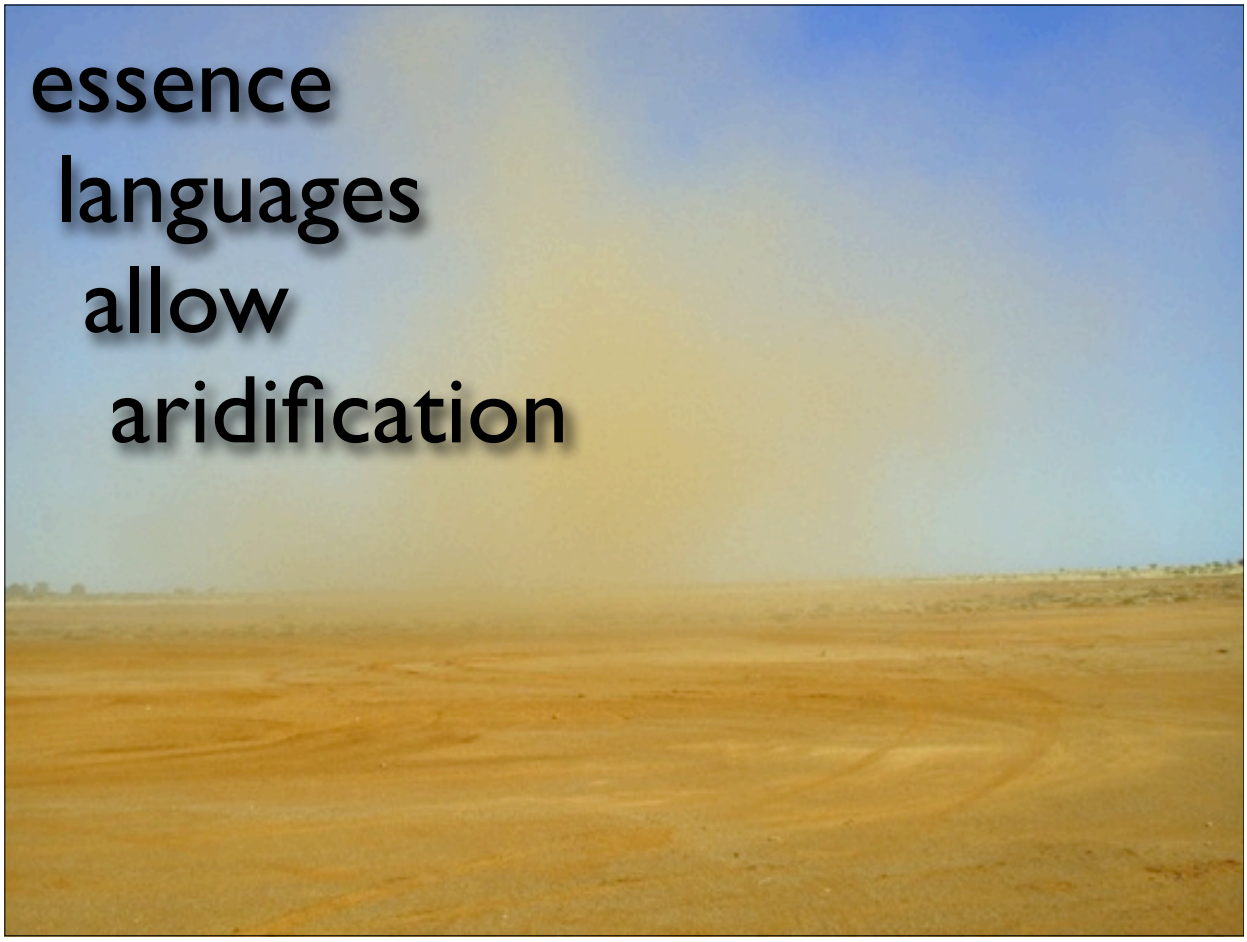
```ruby
class NilClass
  def blank?
    true
  end
end
```



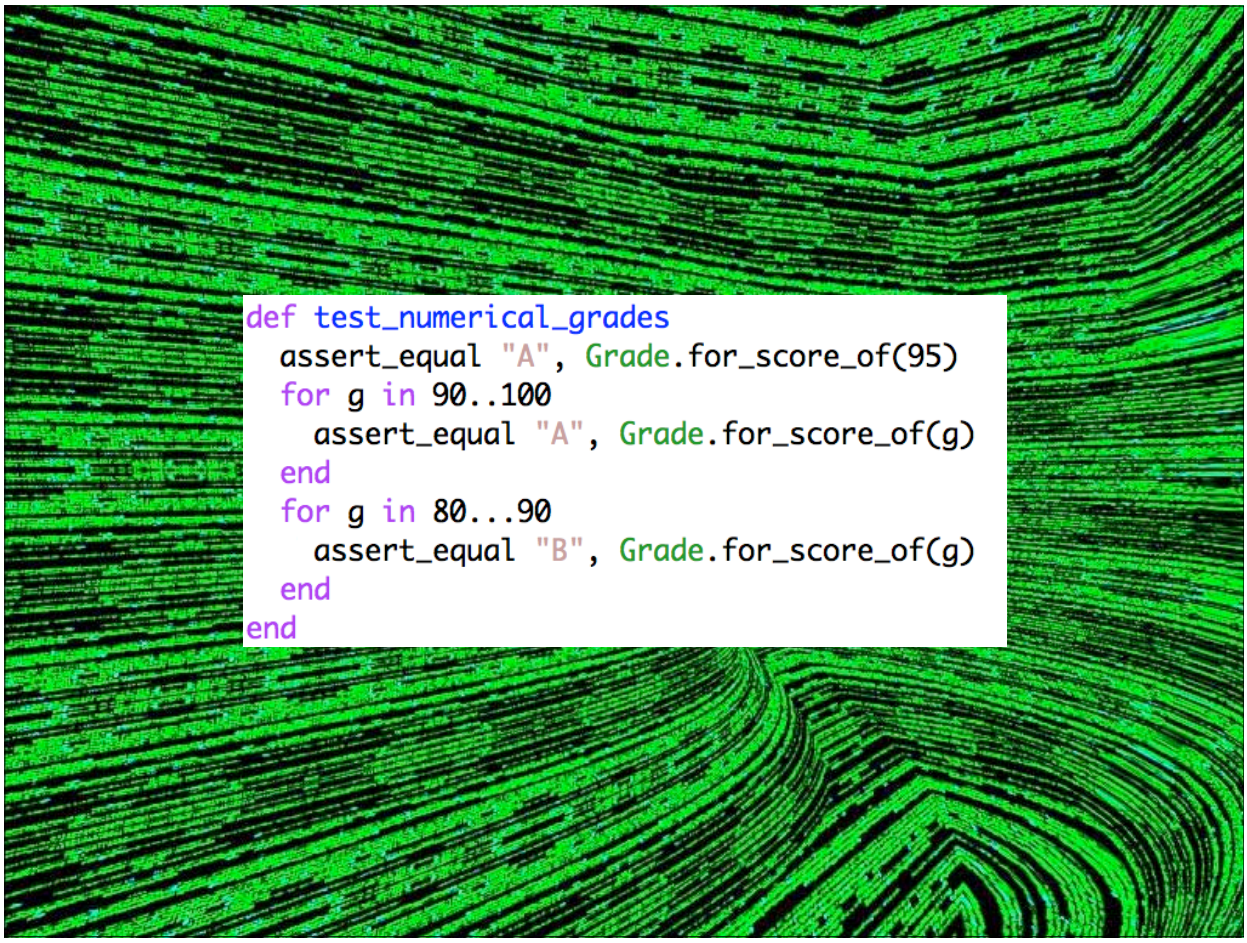
d r y

don't repeat yourself


ceremonious languages
generate floods


essence
languages
allow
aridification

```ruby
class Grade
  class << self
    def for_score_of(grade)
      case grade
        when 90..100: 'A'
        when 80..90 : 'B'
        when 70..80 : 'C'
        when 60..70 : 'D'
        when Integer: 'F'
        when /[A-D]/, /[F]/ : grade
        else raise "Not a grade: #{grade}"
      end
    end
  end
end
```



```ruby
def test_numerical_grades
  assert_equal "A", Grade.for_score_of(95)
  for g in 90..100
    assert_equal "A", Grade.for_score_of(g)
  end
  for g in 80...90
    assert_equal "B", Grade.for_score_of(g)
  end
end
```

```ruby
TestGrades.class_eval do
  grade_range = {
    'A' => 90..100,
    'B' => 80...90,
    'C' => 70...80,
    'D' => 60...70,
    'F' => 0...60}

  grade_range.each do |k, v|
    method_name = ("test_" + k + "_letter_grade").to_sym
    define_method method_name do
      for g in v
        assert_equal k, Grade.for_score_of(g)
      end
    end
  end
end
```

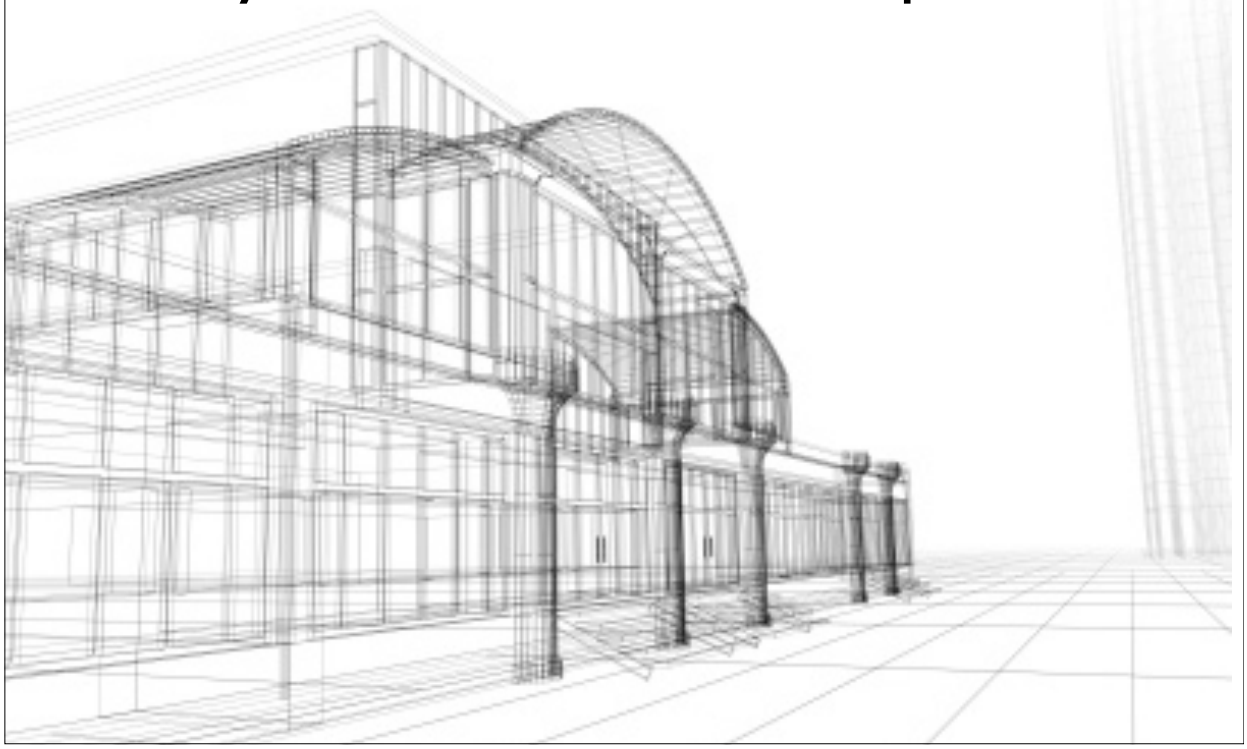
moist tests?

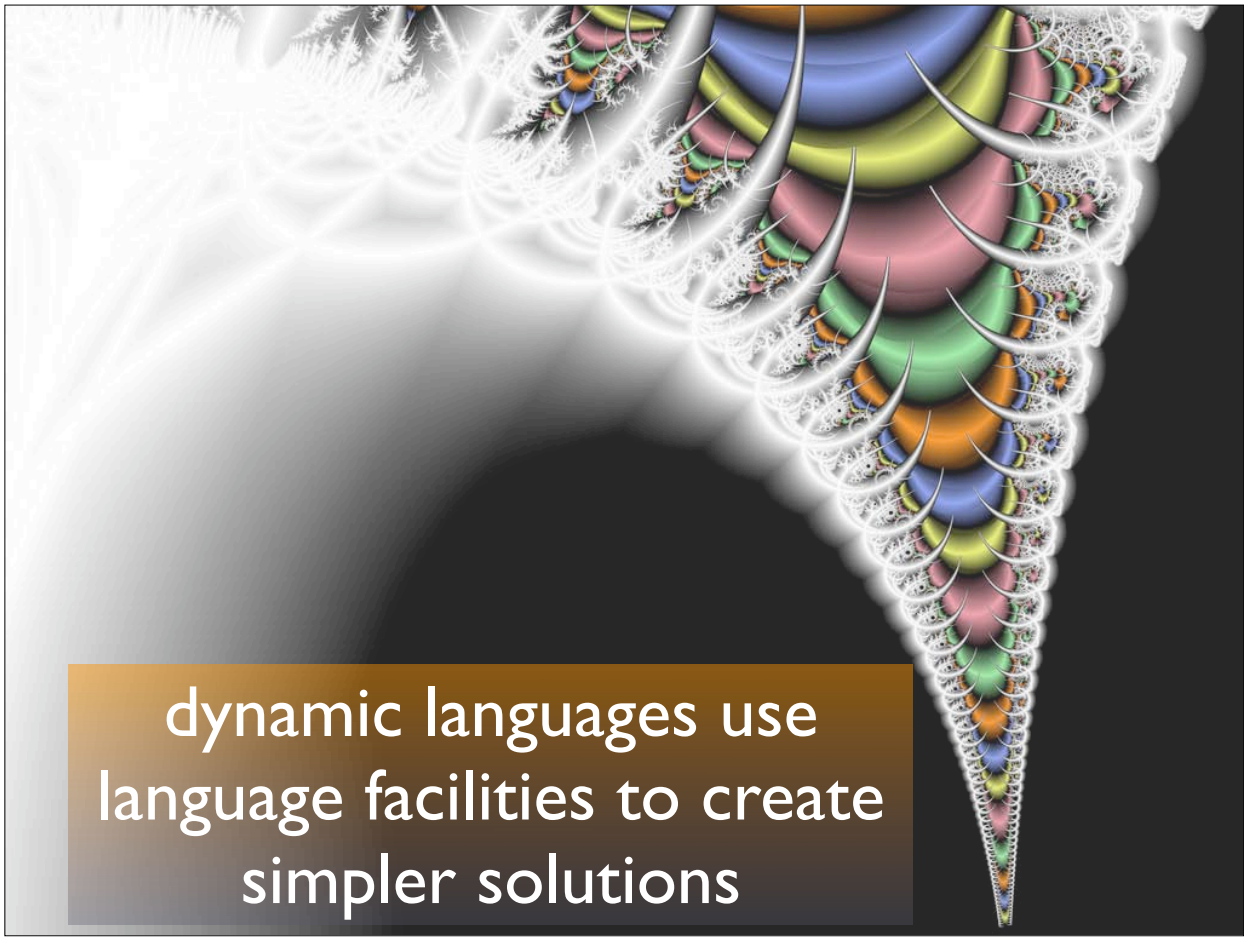
```ruby
def test_delegating_to_array
  arr = Array.new
  q = FQueue.new arr
  q.enqueue "one"
  assert_equal 1, q.size
  assert_equal "one", q.dequeue
end

def test_delegating_to_a_queue
  a = Queue.new
  q = FQueue.new a
  q.enqueue "one"
  assert_equal 1, q.size
  assert_equal "one", q.dequeue
end

def test_delgating_to_a_sized_queue
  a = SizedQueue.new(12)
  q = FQueue.new a
  q.enqueue "one"
  assert_equal 1, q.size
  assert_equal "one", q.dequeue
end
```

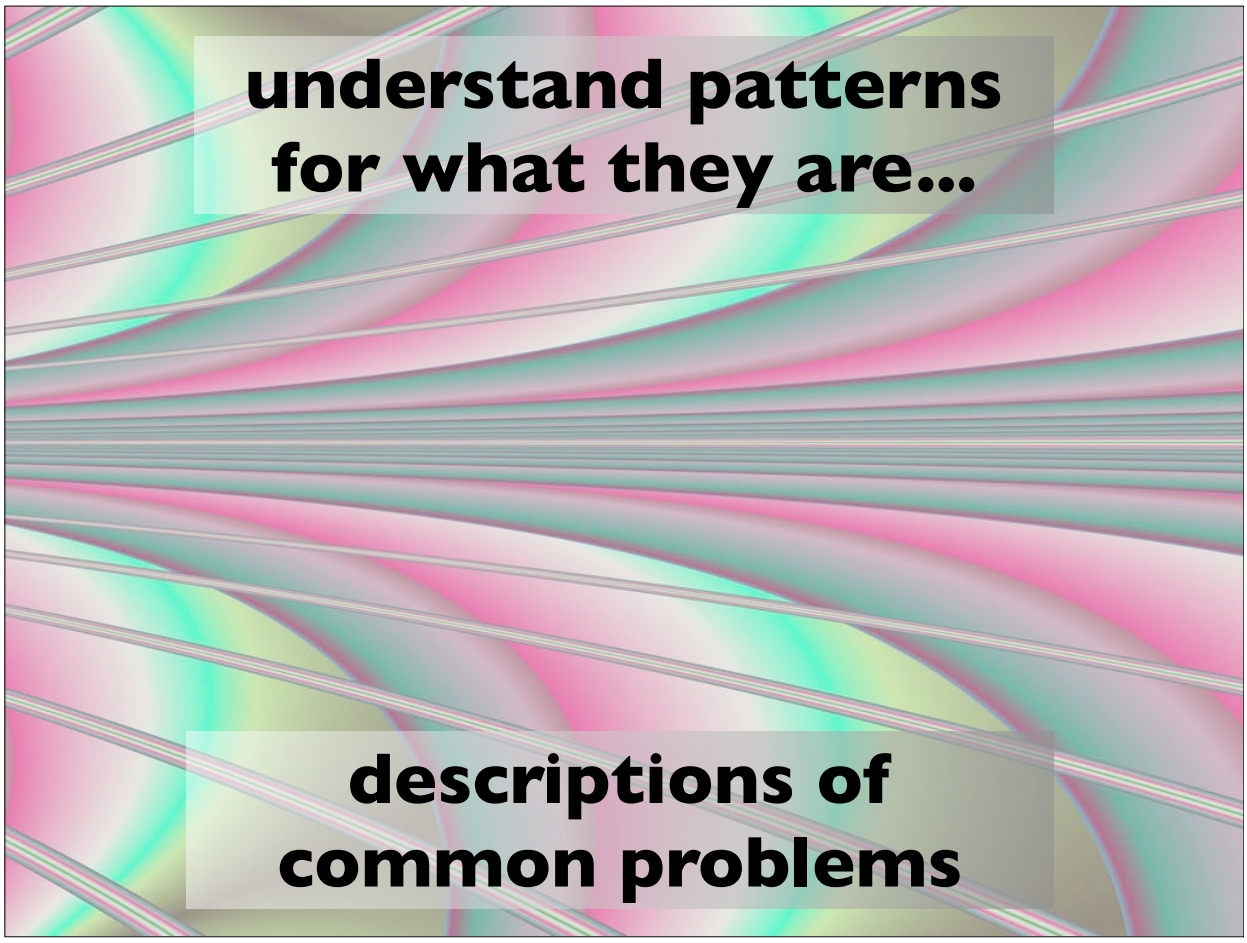
drier tests

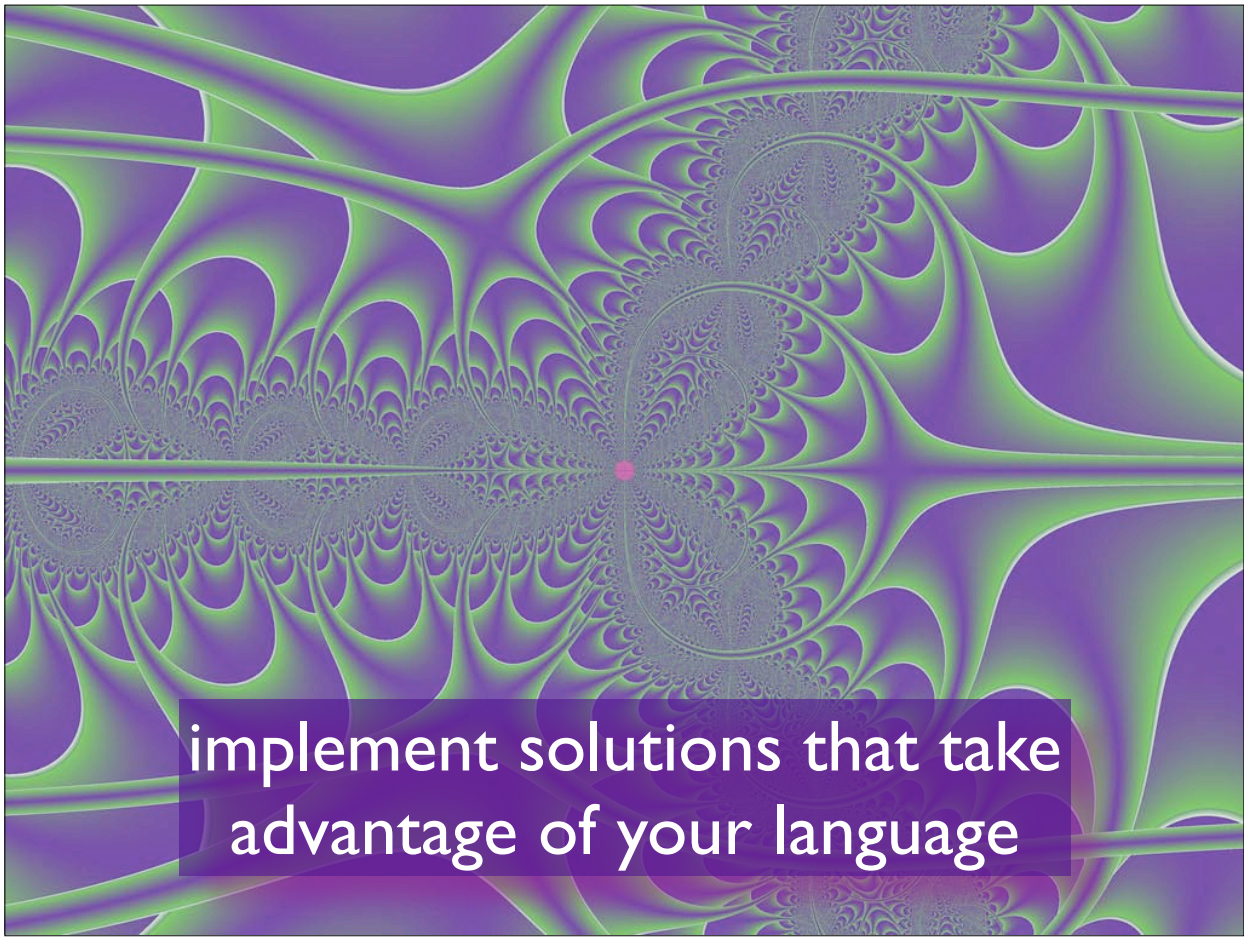
```
TestForwardQueue.class_eval do
   [Array, Queue, SizedQueue].each do |c|
     method_name = "test_queue_delegated_to_" + c.to_s
     define_method method_name do
       a = c == SizedQueue ? c.new(12) : c.new
       q = FQueue.new a
       q.enqueue "one"
       assert_equal 1, q.size
       assert_equal "one", q.dequeue
     end
   end
end
```

“traditional” design patterns rely heavily on *structure* to solve problems




dynamic languages use
language facilities to create
simpler solutions


understand patterns
for what they are...
descriptions of
common problems



ThoughtWorks

? ' s

please fill out the session evaluations
samples at **`github.com/nealford`**

NEAL FORD software architect / meme wrangler

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NF

resources

Execution in the Kingdom of Nouns Steve Yegge
http://steve-yegge.blogspot.com/2006/03/execution-in-kingdom-of-nouns.html

Design Patterns in Groovy on groovy.codehaus.org
http://groovy.codehaus.org/Design+Patterns+with+Groovy

Design Patterns in Ruby
Russ Olsen