Midterm 1 Review Session

Credit to {Alec, Kevin, Stephanie, Steven} of Previous CS 169 Course Staff

Logistics

- Midterm tonight (10/8)
  - 7 - 9pm, GBP 100

- HW 4 peer reviews due 10/11 11:59pm

- HW 5 due 10/13 11:59pm

Agenda

1. Testing (BDD/Cucumber)
2. Sinatra
3. Rails (MVC/ActiveRecord)
4. Ruby
5. REST/URIs
6. Software Development Cycles
7. Q&A

Testing

Testing

Program testing can be used to show the presence of bugs, but never to show their absence!

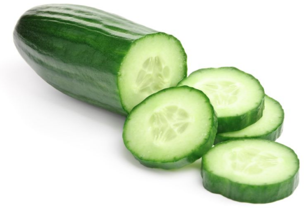
- Edsger Dijkstra

BDD

Behavior-driven design asks questions about **behavior of the app** (not implementation) before and during development to reduce miscommunication between stakeholders.

One way to test is with **Cucumber.**

Cucumber example

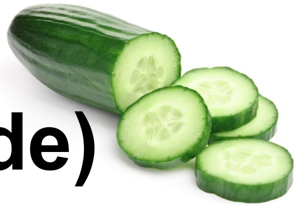


Step 1: Describe your feature’s behavior in plain English.

Feature: Addition
  As a math student
  So that I can avoid mistakes
  I want to be given a sum of two numbers.

Scenario: Add 2 numbers
  Given I have entered 2 into the calculator
  Given I have entered 7 into the calculator
  When I press add
  Then the result should be 12

Step 2: Step definition (regex + real code)



```
Given /I have entered (.*) into the calculator/ do |n|
  calculator = Calculator.new
  calculator.push(n.to_i)
end
```

Debugging

R: Read the error message
A: Ask an informed question
P: Post online (StackOverflow, Piazza)
(or)
S: Search the web (Google, StackOverflow)

Ways to Debug

Instrumentation: print things.
Stop the show: raise the object in question as an exception, view the exception page generated by Rails.
Print to log: use logger.debug(msg) to print to log
Use a debugger: set breakpoints and examine the state of your app at any time

Sinatra

Sinatra

Ruby domain-specific-language for building web applications.

Example

```
# app.rb
require 'sinatra'

get '/' do
  'Hello world!'
end
```

Example

```
# app.rb
require 'sinatra'

get '/' do
  'Hello world!'
end
```

```
$ ruby app.rb # starts on localhost:4567
```

Example

```
# app.rb
require 'sinatra'

get '/' do
  'Hello world!'
end
```

```
$ ruby app.rb # starts on localhost:4567
```

```
$ curl localhost:4567 # returns:
Hello there!
```

POST

```
# app.rb
require 'sinatra'

post '/data' do
  params.to_s
end
```

```
$ curl -d "hello=there" -X POST localhost:4567/data # returns ?
```

POST

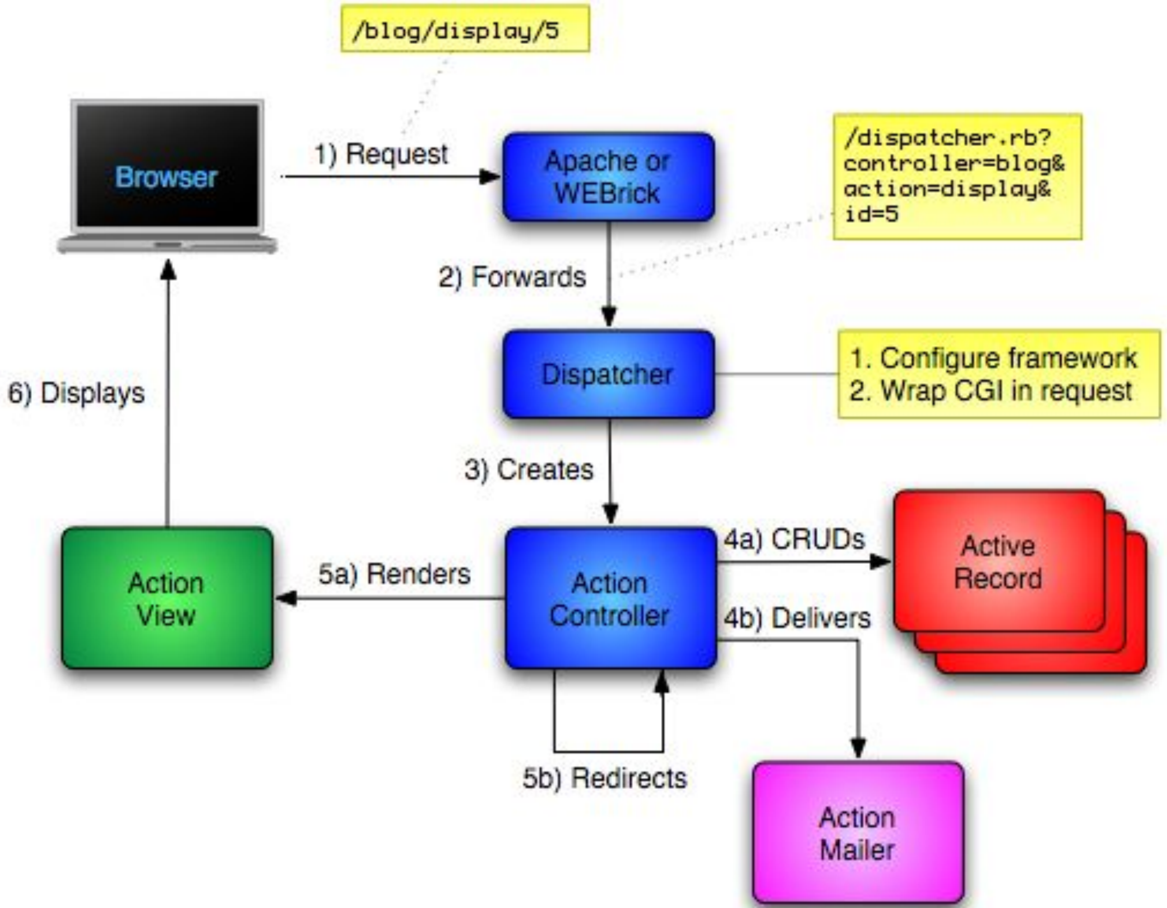
```
# app.rb
require 'sinatra'

post '/data' do
  params.to_s
end
```

```
$ curl -d "hello=there" -X POST localhost:4567/data # returns ?
{"hello"=>"there"}
```

Rails

MVC, ActiveRecord

MVC



/blog/display/5
Browser
1) Request
Apache or WEBrick
/dispatcher.rb?
controller=blog&
action=display&
id=5
2) Forwards
Dispatcher
1. Configure framework
2. Wrap CGI in request
3) Creates
6) Displays
Action View
5a) Renders
Action Controller
4a) CRUDs
Active Record
4b) Delivers
5b) Redirects
Action Mailer

MVC

Model: methods to get/manipulate data (ActiveRecord).

```
Movie.where(..), Movie.find(..)
```

Controller: get data from Model, make available to View.

```
def show
    @movie = Movie.find(params[:id])
end
```

View: display data, allow user interaction (*.erb).

ex: show details of a movie (description, rating)

Rails MVC

Model: app/models/hangperson.rb

Controller: app/controllers/game_controller.rb

View:

- app/views/game/**new**.html.erb
- app/views/game/**show**.html.erb
- app/views/game/**win**.html.erb
- app/views/game/**lose**.html.erb

ActiveRecord

Automated mapping between classes and tables, attributes and columns

Basic operations on object: CRUDI (Create, Read, Update, Delete, Index)

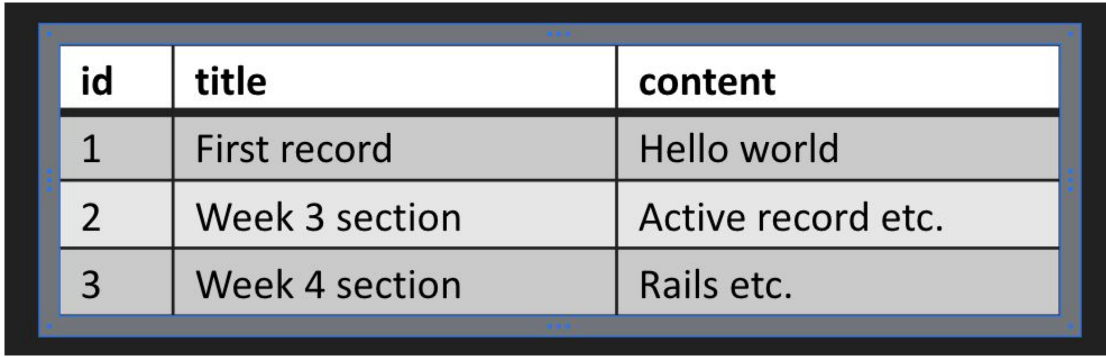
Acts a bridge between memory and database

AR Example

```
class Article < ActiveRecord::Base {
  :id       => :integer,
  :title    => :string,
  :content => :text
}
```

AR Example

```
a = Article.new
a.title = "Week 5"
a.save
```



id	title	content
1	First record	Hello world
2	Week 3 section	Active record etc.
3	Week 4 section	Rails etc.

Ruby

Everything is an Object

```
1 + 2
```

Everything is an Object

$1 + 2 \xrightarrow{\qquad\qquad\qquad\qquad} \texttt{1.send(:+, 2)}$

Everything is an Object

1 + 2 $\longrightarrow$ 1.send(:+, 2)

my_array[4]

Everything is an Object

$$\begin{tikzcd}
\texttt{1 + 2} \arrow[r] & \texttt{1.send(:+, 2)} \\
\texttt{my\_array[4]} \arrow[r] & \texttt{my\_array.send(:[], 4)}
\end{tikzcd}$$

Everything is an Object

```
1 + 2                 →   1.send(:+, 2)
my_array[4]           →   my_array.send(:[], 4)
my_array[3] = "foo"
```

Everything is an Object

`1 + 2` $\longrightarrow$ `1.send(:+, 2)`

`my_array[4]` $\longrightarrow$ `my_array.send(:[], 4)`

`my_array[3] = "foo"` $\longrightarrow$ `my_array.send(:[]=, 3,"foo")`

Everything is an Object

```
1 + 2                ───────────────────►  1.send(:+, 2)
my_array[4]          ───────────────────►  my_array.send(:[], 4)
my_array[3] = "foo"
                     ───────────────────►  my_array.send(:[]=, 3,"foo")
if (x == 3)  ....
```

Everything is an Object

```
1 + 2                    →   1.send(:+, 2)
my_array[4]              →   my_array.send(:[], 4)
my_array[3] = "foo"      →   my_array.send(:[]=, 3,"foo")
if (x == 3)  ....        →   if (x.send(:==, 3)) ...
```

Everything is an Object

`1 + 2`	`1.send(:+, 2)`
`my_array[4]`	`my_array.send(:[], 4)`
`my_array[3] = "foo"`	`my_array.send(:[]=, 3,"foo")`
`if (x == 3)  ....`	`if (x.send(:==, 3)) ...`
`my_func(z)`	

Everything is an Object

`1 + 2`	`1.send(:+, 2)`
`my_array[4]`	`my_array.send(:[], 4)`
`my_array[3] = "foo"`	`my_array.send(:[]=, 3,"foo")`
`if (x == 3)  ....`	`if (x.send(:==, 3)) ...`
`my_func(z)`	`self.send(:my_func, z)`

Getter/Setter

```
def balance
    @balance
end

def balance=(new_amount)
    @balance = new_amount
end
```

Getter/Setter

```
def balance
  @balance
end

def balance=(new_amount)
  @balance = new_amount
end
```

$\longrightarrow$ attr_accessor :balance

REST & URIs

REST

REpresentational **S**tate **T**ransfer (2000)

Focuses on performing operations on application resources

Everything is a resource, with different possible representations (JSON/HTML)

Multiple HTTP verbs, most common is GET

Others include POST, PATCH, UPDATE, DELETE

URIs

Uniform Resource Identifier

Useful for interacting with online resources (e.g., images, stylesheets, form submission targets)

Examples:
https://en.wikipedia.org/wiki/Uniform_Resource_Identifier#Examples

Example

https://www.etsy.com:443/search?q=test#copy

Example

- https
- www.etsy.com
- 443
- /search
- ?q=test
- #copy

Example

- https - **scheme**
- www.etsy.com - **hostname**
- 443 - **port**
- /search - **path**
- ?q=test - **query string**
- #copy - **fragment**

Software Development Cycles

Waterfall

1. Requirements analysis & specification
2. Architectural design
3. Implementation & integration
4. Verification
5. Operation & maintenance

What was the problem with Waterfall?

Spiral

Built prototypes in each iteration

Plans and documents evolve with changes to product

What doesn’t this work for?

Agile

1. Individuals and interactions over processes & tools
2. Working software over comprehensive documentation
3. Customer collaboration over contract negotiation
4. Responding to change over following a plan.

Differences

1. Is specification required?
2. Are customers unavailable?
3. Is the system to be built large?
4. Is the system to be built complex (e.g., real time)?
5. Will it have a long product lifetime?
6. Are you using poor software tools?
7. Is the project team geographically distributed?
8. Is team part of a documentation-oriented culture?
9. Does the team have poor programming skills?
10. Is the system to be built subject to regulation?

Testing in P&D vs Agile

How would you expect testing in Agile to be different from testing in P&D models?

Testing in P&D vs Agile

How would you expect testing in Agile to be different from testing in P&D models?

Agile involves constantly testing for every iteration, even before code is written.
P&D starts testing after implementation

Testing in P&D vs Agile

What else is different?

Testing in P&D vs Agile

What else is different?

In P&D expensive formal methods (human or computer) can be used to prove that code follows specification.

Testing in P&D vs Agile

What else is different?

In P&D developers write unit tests, but dedicated QA developers write module, integration, system, and acceptance tests.

Q&A