Announcements

- **Lab 1 due on Wednesday by 11:59 PM**
  - Email it to cse438ta@gmail.com
- **Lab 2 is due on Wednesday June 27th**
  - I will post lab 2 in the next 24 hours
- **We will hold Studio 2 on Wednesday**
  - Meet in Whitaker Mac Lab on Wednesday

Today's Topics

- **Additional Swift Concepts**
- **Views Introduction**
- **MVC**
- **Lab 2**
- **MVC and Auto Layout Demos**

Lazy Initialization of Properties (CS193p)

- **Lazy properties do not get initialized until someone accesses them**
- **You can allocate objects, execute a closure, or call a method**

```
lazy var theResult = LotsOfWorkObject()

lazy var someProperty: Type = {
  // construct the value of someProperty here
 return (the constructed value)
}()

lazy var myProperty = self.initializeMyProperty()
```


Initialization in Swift

- **Classes and structures must set all of their stored properties when created**
- **Various way to set properties (without an init)**
  - Define default values
  - Properties may be Optional (so they start out as nil)
  - Initialize a property by setting a closure
  - Use lazy instantiation
- **Use an init when values can not be set using the previous examples**
  - You can have as many init methods in your class or struct
  - Each init will have different arguments

Initialization (CS193p)

- **Some init methods are for free**
  - Free init() given to all base classes
    - A base class has no superclass
  - If a struct has no initializers, it will get a default one will all properties as arguments

Initialization (CS193p)

- **What can I do with an init?**
  - Set property values, even those that already had defaults
  - Constant properties (those declared with let) can be set
  - You can call other init methods in your own class or stuct using self.init(args)
  - In a class, you can also call super.init(args)
    - There are some rules for calling inits from other inits in a class

Class Initialization Requirements (CS193p)

- **After init completes all properties must have values (Optionals can be nil)**
- **A class has two types of inits**
  - Convenience and designated
- **Designated init**
  - Must (and can only) call a designated init in its immediate superclass
  - You must initialize all properties introduced by your class before calling a superclass's init
  - You must call a superclass's init before you assign a value to an inherited property
- **Convenience init**
  - Must (and can only) call an init in its own class
  - Must call that init before it can set any property values
  - The call of other inits must be completed before you can access properties or invoke methods

Initialization (CS193p)

- **Inheriting init**
  - If you do not implement any designated inits, you will inherit all of you superclass's designated inits
  - If you override all of your superclass's designated inits, you'll inherit all its convenience inits
  - If you implement no inits, you will inherit all of your superclass's inits
  - Any init inherited by these rules qualifies to satisfy any of the rules on the previous slide
- **Required init**
  - A class can mark one or more of its init methods as required
  - Any subclass must implement those init methods
    - They can be inherited per rules above

Failable init (CS193p)

- **If an init is declared with a ? after the word init, it returns an Optional**

```
init? (arg1: Type1,..) {
  // might return nil here (means init failed)
}
```

- **Example**

```
Let image = UIImage(named:"foo")  //image is Optional UIImage
```

- **Typically use if-let for these cases**

```
If let image = UIImage(named: "foo " ) {
 // image  was successfully created
} else {
   // failed to create image
}
```


Demo

Views

View Fundamentals

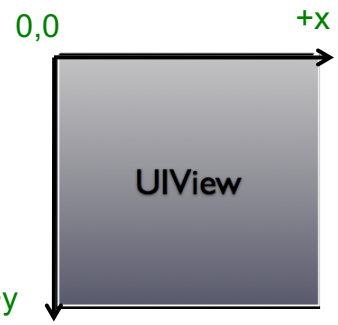
- Rectangular area on screen
- Draws content
- Handles events
- Subclass of UIResponder (event handling class)
- Views arranged hierarchically
  - every view has one superview
  - every view has zero or more subviews

View Hierarchy - UIWindow

- **Views live inside of a window**
- **UIWindow is actually just a view**
  - adds some additional functionality specific to top level view
- **One UIWindow for an iOS app**
  - Contains the entire view hierarchy
  - Set up by default in Xcode template project

UIView Coordinate System

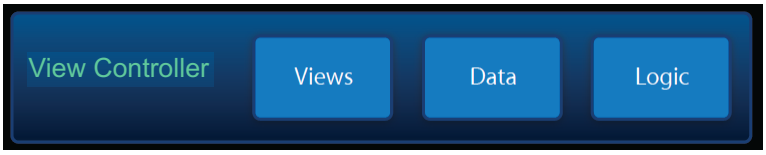
- **Origin in upper left corner**
- **y axis grows downwards**
- **Units are points, not pixels**
  - Points are units of coordinate system
  - Pixels are min size unit of drawing
  - Typically 2 pixels per point
    - var ContentScaleFactor



View Controllers

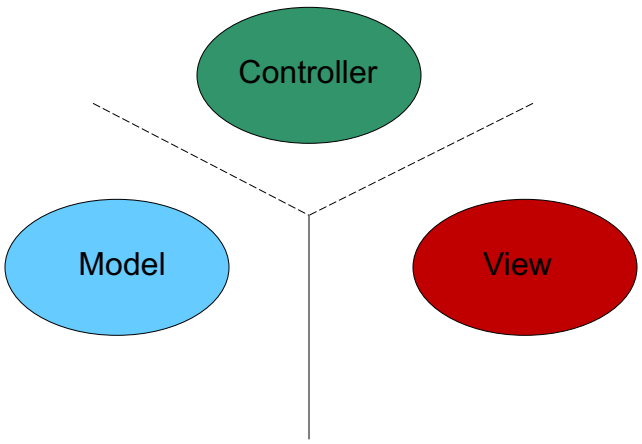
UIViewController

- Basic building block
- Manages a screenful of content
- Subclass to add your application logic



Model, View, Controller

Model, View, Controller



Model

- Manages the app data and state
- Not concerned with UI or presentation
- Often persists somewhere
- Same model should be reusable, unchanged in different interfaces

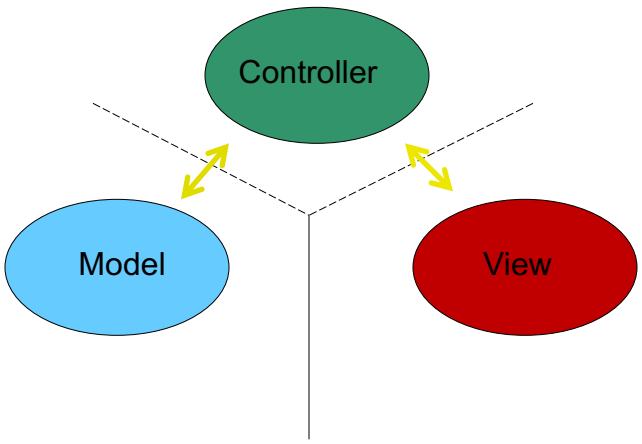
View

- Present the Model to the user in an appropriate interface
- Allows user to manipulate data
- Does not store any data
  - (except to cache state)
- Easily reusable & configurable to display different data

Controller

- Intermediary between Model & View
- Updates the view when the model changes
- Updates the model when the user manipulates the view
- Typically where the app logic lives

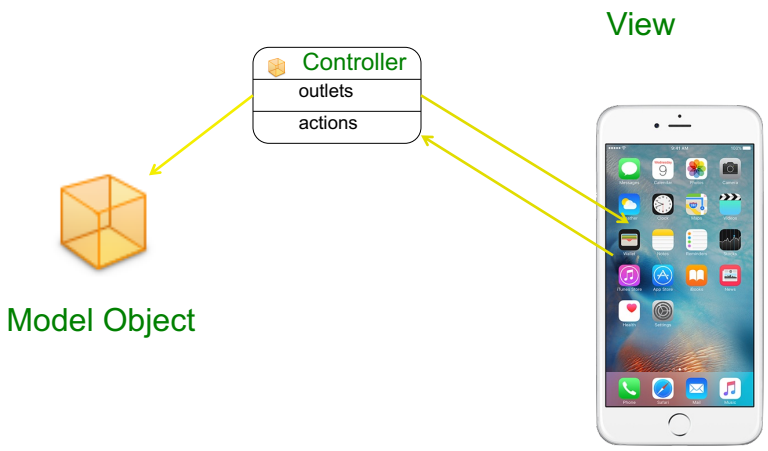
Model, View, Controller



Why Model-View-Controller?

- Separating responsibilities also leads to reusability
- By minimizing dependencies, you can take a model or view class you've already written and use it elsewhere
- Think of ways to write fewer lines of code

Model, View, Controller



Lab 2

MVC Demo

Auto Layout Demo