Announcement

• Final Project Descriptions are due tonight (Tuesday July 7th) by 11:59 PM

• Final Project Presentations are on Thursday

• Lab 4 is due on Thursday July 16th

Today’s Topics

• Final Projects

• Mapkit

• Core Location
Project Descriptions

- Team Member’s names
  - “Groups” of 2 – 3 students

- 1 Paragraph description of the project

- Project Name

- Due on Tuesday July 7th by 11:59 PM

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Final Project Point Distribution and Due Dates

- The final project accounts for 30% of your final grade
  - Final project score is out of 100 points

- Final Project Group Description – 5 points
  - Due on Tuesday July 7th by 11:59 PM

- Project Proposal Presentation – 15 points
  - Submit as PPT, Keynote, or Google slides
  - Due on Thursday July 9th by 3 PM

- Project Update Presentation – 10 points
  - Provide a brief description of what has been accomplished in the email
  - Submit code to demonstrate the accomplishments
  - Due on Thursday July 23rd by 3 PM

- Final Project Code - 70 points
  - Due on Thursday July 30th by 3 PM

- Submit all portions of the final project to cse438ta@gmail.com

- Late submissions will result in a 0 for that portion of the final project
Final Project Proposal Presentations

• Each group will have 5 minutes to present their app

• If no one from your group is here to present your project you will receive a 0 on that portion of the project

Requirements for Project Proposal Presentation

• Motivate the need for the app

• Explain the pieces involved in creating the app

• Show a distribution of work for each team member

• Provide a detailed timeline with tasks and deliverable dates
  – What will be accomplished by the update presentation?
    • Will you demo a skeleton GUI by the update meeting?
  – What will you show at the final presentation?

• Include a wireframe for your entire application
  – Each “screen” of your app should be included
  – Consider using Keynote, PowerPoint, fluidui.com or ninjamock.com
Final Project
Student Ideas?

Apps from Previous Semesters
Matt Lanter’s App

- **WashU Maps**
  - Integrate with information about dining hours and menus
  - Adding campus transportation and metro bus routes to map along with schedules
  - Add department locations to map (e.g. it will show you which building they are in)

Matt Lanter’s Apps

- **WebSTAC**
  - Adding other WebSTAC functionality (grades, gpa, course listings, registration, registration worksheet, etc.)
  - Add Telesis functionality
  - Add support for adding campus card points (either using function of WebSTAC or https://acadinfo.wustl.edu/eTransact/)
  - Add other campus life information, such as dining locations, hours, menus, important phone number
Meetups

- Created by Jake LaMountain and James Farner
- Helps you keep track of your friends’ schedules and locations
- Use GPS coordinates and a map of WashU

I am Here

- Created by HT Kwon and Andrew Shaw
- Game where you “tag” your friends
- Uses coreLocation and mapSDK
eFlick

• Created by Justin McClain and Simon Tam

• Game with a purpose

• Help tag events happening at WashU

• Uses core animation and gestures

iFitness Manager

• Developed by Eric Peters

• Continued on as an independent study

• Made it to the App Store
  – Paid and Free Versions available
iFitness Manager

iDrink

- Developed by Josh Mason and Julie Betlach

- Elevator Pitch:
  - Do you have various alcohols and other ingredients and need to make a drink, but don’t know what to mix together?
Gomoku and Sudoku

Oh Man! This is the most fun game I have ever played!

New Game
Options
Continue
Credits

Amber Alert

Yadira Reid
Age: 13
Missing From HARTFORD, CT
Missing Since 01-05-2003

Alii Trabulsky
Age: 19
Missing From WINDSORLOCKS, CT
Missing Since 08-10-2005

Tristan Trabulsky
Age: 16
Missing From WINDSORLOCKS, CT
Missing Since 08-10-2005

Shaina Tarat
Age: 11
Missing From NEW BRITAIN, CT
Missing Since 12-20-2003

Rahim Tarat
Age: 16
Missing From NEW BRITAIN, CT
Missing Since 12-20-2003

Missing by State
Connecticut

12:00 PM
Games with a Purpose

http://en.wikipedia.org/wiki/Human-based_computation_game
MapKit

What is MapKit?

• API to display Maps

• Classes to translate between CLLocation and human-readable addresses

• Support for “annotations” (pins on a map)

• Reverse Geocoding
MKMapView

- Handles display of map
- “Map” & “Satellite” types
- Panning and Zooming
- Annotations
- Display User Location

Properties in MKMapView

```swift
var region: MKCoordinateRegion
var centerCoordinate: CLLocationCoordinate2D
var userLocation: MKUserLocation
var annotations: [MKAnnotation]
var delegate: MKMapViewDelegate?
MKMapType mapType
```
MKMapViewDelegate

- Callback methods about loading state:
  
  ```swift
  func mapViewWillStartLoadingMap(_ mapView: MKMapView)
  func mapViewDidFinishLoadingMap(_ mapView: MKMapView)
  func mapViewDidFailLoadingMap(_ mapView: MKMapView,
      withError error: Error)
  ```

- Callback methods about region changes:
  
  ```swift
  func mapView(_ mapView: MKMapView,
      regionWillChangeAnimated animated: Bool)
  ```

- func mapView(_ mapView: MKMapView,
      regionDidChangeAnimated:animated Bool)

- Callback methods to customize and interact with annotations
  
  ```swift
  func mapView (MKMapView, viewFor : MKAnnotation)
  func mapView (MKMapView, didAdd: [MKAnnotationView])
  func mapView (MKMapView, annotationView: MKAnnotationView,
      calloutAccessoryControlTapped: UIControl )
  ```
MKAnnotation

- A protocol - not a class
- Add to a MapView to plot pins
  var coordinate: CLLocationCoordinate2D

  var title: String?
  var subtitle: String?

MKPlacemark

- Conforms to MKAnnotation protocol
- Convenience for holding human-readable addresses alongside Coordinate

  init(coordinate: CLLocationCoordinate2D, addressDictionary: [String : Any]?)

- Easy to convert between AddressBook addresses and location:
  - thoroughfare, subThoroughfare, locality, subLocality, administrativeArea, subAdministrativeArea, postalCode, country, countryCode
MKUserLocation

- Special case of an MKAnnotation
- Represents device’s location only
  - You do not create instances of this class directly
  - Retrieve an existing MKUserLocation object from userLocation property of map

```swift
var location: CLLocation?
var isUpdating: Bool
var title: String?
var subtitle: String?
```
Core Location

- What is it?
- Core Location

Activate service
Location ring
Core Location
Core Location

• Location Technologies

Bootstrap
Crosscheck
Complement
Core Location Framework

• The core classes and protocols
  • Classes
    – CLLocation
      • Represents a point and vector in the real world
    – CLLocationManager
      • Allows you to get a CLLocation
  • Protocol
    – CLLocationManagerDelegate
Core Location Framework

- **CLLocationManagerDelegate** protocol

- Several useful optional methods
  
  ```swift
  func locationManager(_ manager: CLLocationManager, didUpdateLocations: [CLLocation])
  func locationManager(_ manager: CLLocationManager, didFailWithError: Error?)
  ```

- Called asynchronously on main thread
- Issues movement-based updates

Getting a Location

- Starting the location service
  
  ```swift
  let locationManager = CLLocationManager()
  locationManager.delegate = self
  locationManager.requestWhenInUseAuthorization()
  locationManager.startUpdatingLocation()
  ```
**Getting user location**

- iOS 8 introduced additional requirements to obtain your location
  - Call the requestWhenInUseAuthorization method
  - Add an entry to your plist file to request location
    - **NSLocationWhenInUseUsageDescription**

**Getting a Location – Using Event Data**

```swift
func locationManager(manager: CLLocationManager, didUpdateLocations locations: [CLLocation]) {
    let aLocation = locations[0]
    let howRecent = aLocation.timestamp.timeIntervalSinceNow

    if (howRecent < -10) { return }
    if (aLocation.horizontalAccuracy > 100) { return }

    double lat = aLocation.coordinate.latitude
    double long = aLocation.coordinate.longitude
}
```
**Desired Accuracy**

- Choosing an appropriate accuracy level
  ```java
  locationManager.desiredAccuracy = kCLLocationAccuracyBest
  ```

- Choose an appropriate accuracy level
  - Higher accuracy impacts power consumption
  - Lower accuracy is “good enough” in most cases

- Can change accuracy setting later if needed

- Actual accuracy reported in CLLocation object

**Distance Filter**

- Choosing an appropriate update threshold

- New events delivered when threshold exceeded
  ```java
  locationManager.distanceFilter = 3000
  ```
### Stopping the Service

```swift
locationManager.stopUpdatingLocation()
```

- Restart the service later as needed
- Also able to pause service and run in background
  - var `pausesLocationUpdatesAutomatically`: Bool
  - var `allowsBackgroundLocationUpdates`: Bool

### Responding to Errors

- User may deny use of the location service
- Results in a `kCLErrorDenied` error
- Protects user privacy
- Occurs on a per-application basis
Responding to Errors

- Location may be unavailable
- Results in a kCLErrorLocationUnknown error
- Likely just temporary
- Scan continues in background

Demo

GPS Data
Demo
Geocoding

https://github.com/ooper-shlab/GeocoderDemo-Swift