

CSUNav:

The Interactive Multilevel Campus Navigation
Application

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Timeline

First Semester:

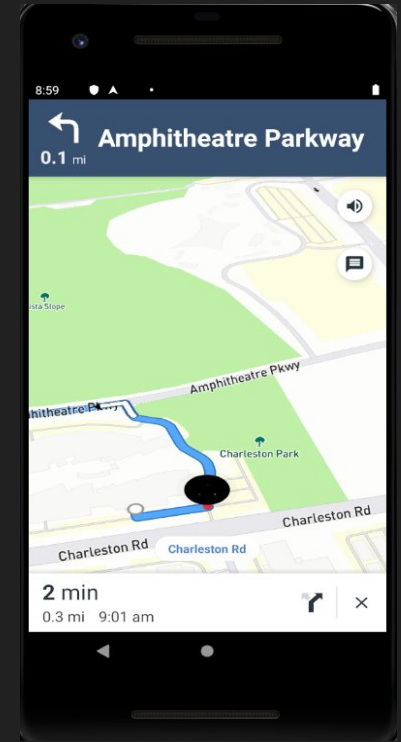
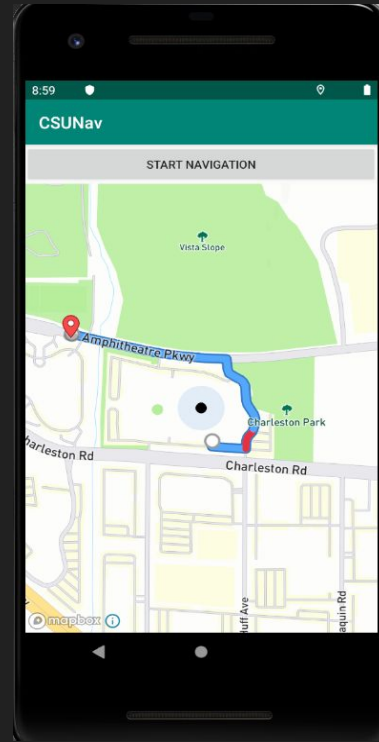
- **Beginning of Semester**
 - Obtain licenses for ArcGIS, floor plans, Android Studio, and other development kits necessary
 - Familiarize ourselves with ArcGIS, Android Studio, Java, and Javascript
 - Assign and organize workload and responsibilities
 - Plan out features and implementations for application
- **Mid-Semester**
 - Design 2D overview map of CSUB campus
 - Start first draft design of GPS application
 - Begin work on outdoor pathing
 - Connect back-end ArcGIS navigation to Android Studio phone application
- **End of Semester**
 - Finish outdoor navigation
 - Finalize Android application
 - Begin work on Indoor Navigation
 - Design and implement indoor floor plans to a new indoor CSUB campus map

Second Semester:

- **Beginning of Semester**
 - Finish indoor navigation and floor implementations
 - Decision and application of any additional features
 - Finalize 3D or 2D map
- **Mid-Semester**
 - Testing/Debugging phase
- **End of Semester**
 - Finished Product by May
 - Presentation at Senior Expo

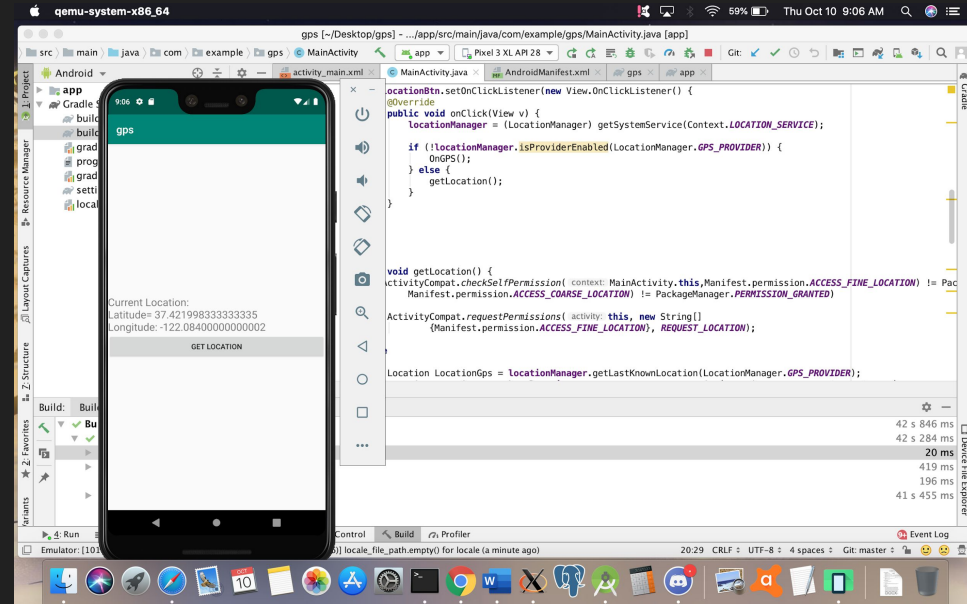
Android Studio Application with Mapbox SDK

- Basic Navigation app built using Mapbox SDK and Android Studio
- Tracks device location and simulates user travelling to destination point
- Creates a pin with touch/click and shows fastest route to destination



Android Studio - LocationManager

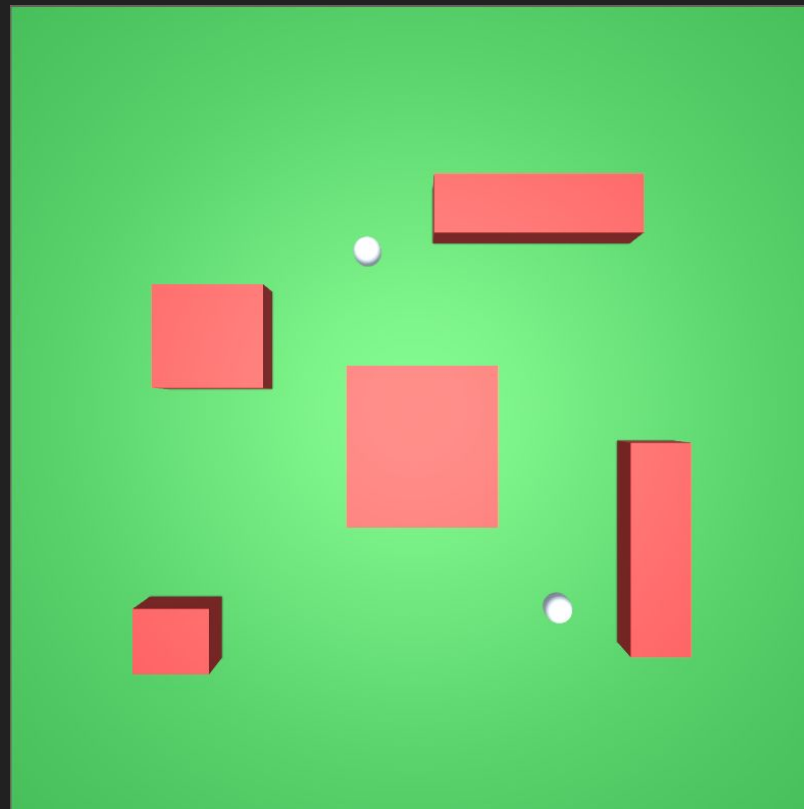
- Location Manager
 - Obtain user permission
 - Access user location
 - Get longitude and latitude



```
<uses-permission android:name="android.permission.ACCESS_FINE_LOCATION"></uses-permission>  
<uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION"></uses-permission>  
<uses-permission android:name="android.permission.INTERNET"></uses-permission>
```

Grid and Node System

- 2D Array of Node Objects
 - Size of map divided into square partitions
 - Bool traversable
 - Cost variable
- Overlay of Buildings
 - Nodes touched by building are untraversable
- Seeker and Target
 - Apply A* search algorithm for best path
 - Accounts for obstacles
 - Fills in nodes that occupy best path



A* Search Algorithm

Begin at start node

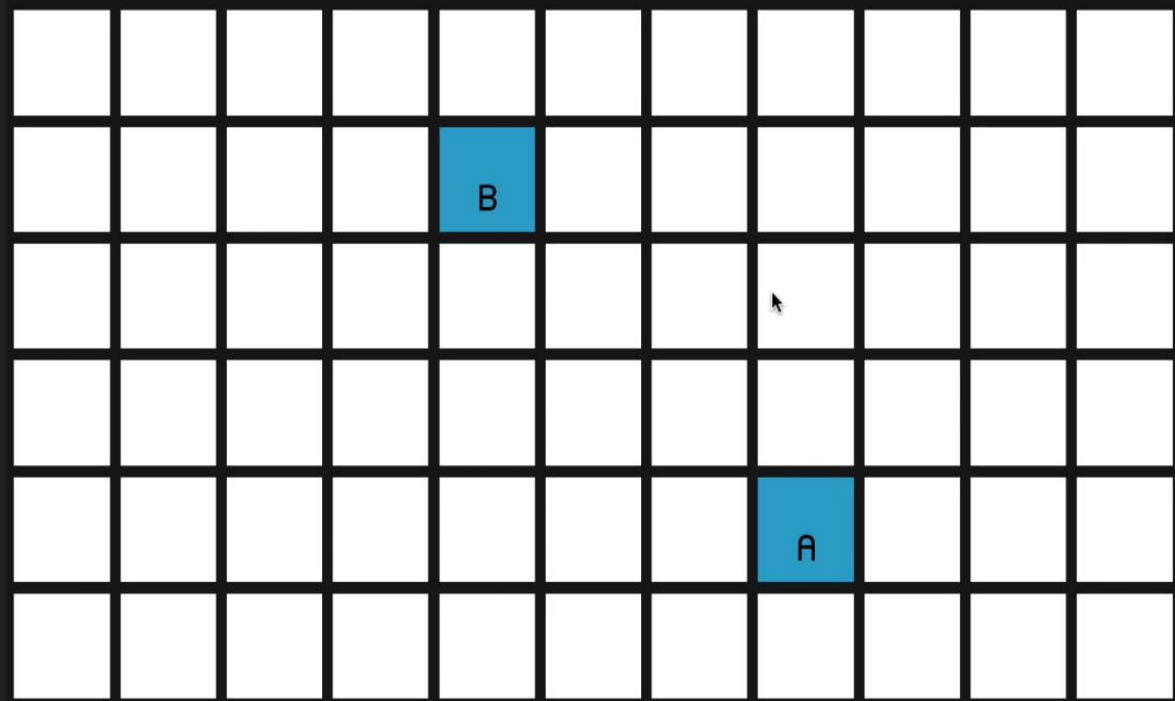
Loop

- Current = node in OPEN with lowest cost
- Remove current from OPEN
- Add current to CLOSED

- If current is target node
 - Return

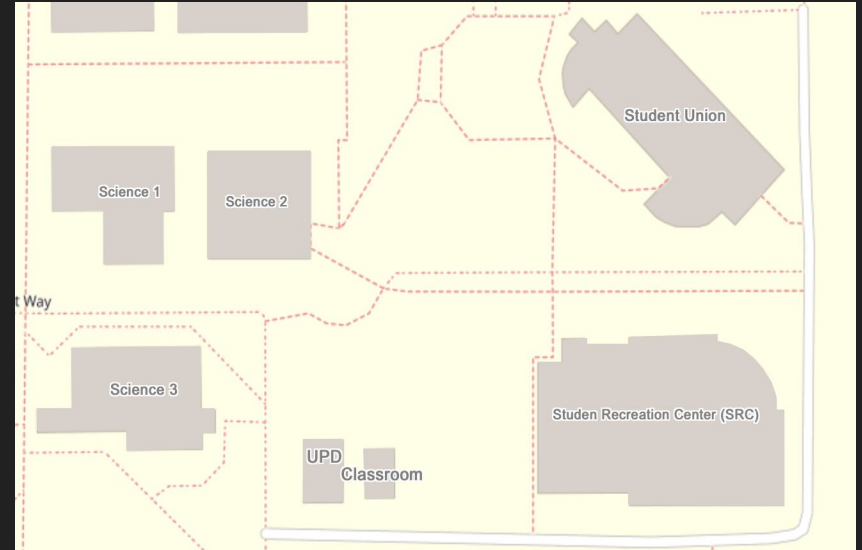
- Foreach neighbor of current node
 - If neighbor is in CLOSED or untraversable
 - Skip to next neighbor

- If new path is shorter and in OPEN
 - Set cost to cost neighbor
 - Set parent of neighbor to current
- If neighbor is not in open
 - Add neighbor to open



CSUB Map


- Map generated using ArcGIS
 - Buildings relabeled
- To do:
 - Create buildings not on map yet
 - Label all buildings
 - Label all pathways





CSUB Building Coordinates

- ArcGIS
 - Latitude/Longitude
 - Coordinates of doorways
 - Boundary of buildings

Find area, length, or location ✕

 | Degrees ▾

Measurement Result

	Latitude	Longitude
	35.350803	-119.102445
	35.350382	-119.103615

	A	B	C
1			
2	Building Name	Latitude	Longitude
3	DDH	35.350385	-119.103618
4	Runner Café	35.350769	-119.102224
5	Science 1	35.349645	-119.103768
6	Science 2	35.349645	-119.103221
7	Science 3	35.349055	-119.103731
8	SRC	35.348963	-119.101542
9	Testing Room	35.348796	-119.102728
10	UPD	35.348792	-119.102964
11	Walter W. Stiern Library	35.351449	-119.103228