



CSU Bakersfield

School of Natural Sciences,  
Mathematics, and Engineering

# Campus Data For Geo-Location Based Augmented Reality

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## Problem

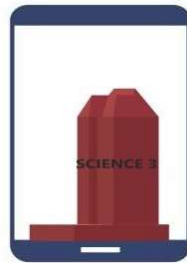
Currently students and guests of the CSUB campus can only navigate around campus based on antiquated maps which may be inaccurate or lead to confusion. They are not efficient at all and do more harm than good. There is no true way of navigating around CSUB without consulting the help of someone who is familiar with the ins and outs of CSUB.

## Solution

The main idea behind our solution stemmed from a conversation our team had while we worked for ITS here at CSUB. Our Director Rich Nelson, spoke about ideas they had that were in the pipeline but very far back and of very low priority. The concept was an interactive map that students could refer to when navigating CSUB. This map would be perfect for both new and returning students because CSUB has many unlabeled buildings and classes tend to be in main areas. There are many locations that are unknown to most students. Our team took this idea and expanded it to an AR, or augmented reality, based mobile app. The app would make primary use of the devices camera and when pointed toward a Point of Interest, or POI, it would display an AR object that would act as a label for that building. This would effectively label all buildings on campus for students.



## Concept & Resources



As can be seen above, our concept came very close to what we were able to produce.

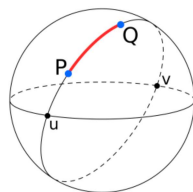
For the development of our app we enlisted the help of the Wikitude SDK which was created with a similar goal to ours. To use AR technology for navigation. We also used Android Studio as our IDE for development. This is an Android app so we also made use of several Android based devices. For version control we relied upon GitHub and our project can be found here:

<https://github.com/saustin15/com.csub.geoAR>

## Highlights

Here we have some logic that took some time to figure out. This is how we handled the distance between two objects given only their coordinates.

$$D = 3963.0 * \arccos[(\sin(lat1) * \sin(lat2)) + \cos(lat1) * \cos(lat2) * \cos(long2 - long1)]$$



Here is where the points data is taken and given meaning. Their properties are read into POIs or Points of interests.

## Web Portal Data Management (JSON)

34	MOD-E3	Modular East	35.350644	-119.101337	Modular East 3
35	FP	Food Pantry	35.3504279	-119.1017964	Food Pantry
36	Home	Andrew's House	35.35437208000001	-119.1013347	

Save Changes to Server  
Load Changes & Refresh Data

Data pulled from server  
(Java & JS)



POIs populated



## Challenges & Setbacks

We had a hard time understanding how the SDK worked. Namely how the data was being populated and what the best way to manage this data would be. We began by using a JSON file to store the points along with other basic info such as coordinates and identifiers. We had also spent a good amount of time on a radar that was eventually scrapped due to it not being consistent with our idea of simplicity. The radar is disabled and can be repurposed.

Data management was also a challenge we faced but we were able to overcome this by way of an online UI. <https://bigpapaburt.com/data/admin>. Here is where our POI properties are managed and kept. <https://bigpapaburt.com/data/> is part of this site and here is where an overhead map with the points labeled can be seen and used.

## Goals & Ambitions

Now that our Augmented Reality application is in production, we have set plans in motion to integrate it with the digital ecosystem at California State University Bakersfield. However, we do not plan on gaining from it monetarily. Instead, as a way of giving back to a University which has given so much to us and with the hope of enriching student life, in the name of the CSUB Computer Science department and with special recognition to our project advisor, Dr. Chengwei Lei, we will be donating our application to the aforementioned University in perpetuity.