

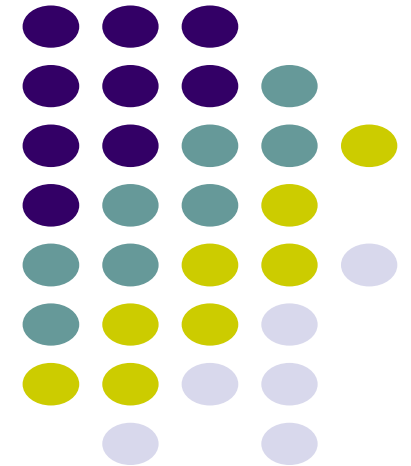
Ubiquitous and Mobile Computing

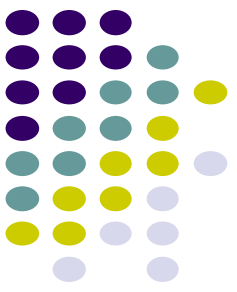
CS 528: *SpaceFinder*

Team 3

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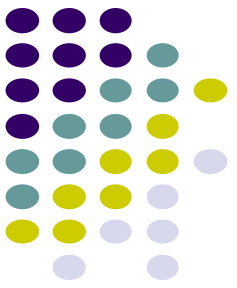
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Introduction

- Finding a study or lab space with the current pandemic restrictions is very difficult
- Need to control the spread of germs to allow students to stay on campus
- Students need access to resources they pay for
- Why a mobile solution?
 - know on the go
 - location aware



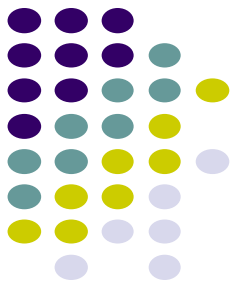
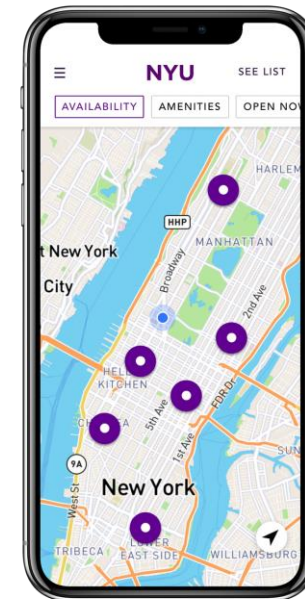
Related Work

- Many college campus have created applications for students to view and reserve study spaces on campus:
 - Scout, IlliniSpaces, SmithScape, and Student Study App
 - Unfortunately, they cannot accommodate for COVID-19

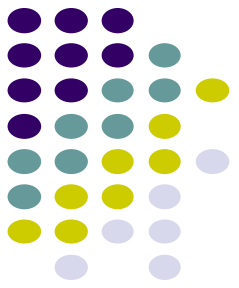


Related Work

- NYU App
 - Integrated study space reservations, using QR code
 - Adapted to work even during the pandemic
- India
 - Created an app that uses Firebase to track when an individual crosses a red zone location in West Bengal



Methodology




- Our approach satisfies the needs of campus staff/lab managers *and* students while respecting COVID-19 restrictions
- **Staff:** Create shared space entries in the app for students to use
 - Use the camera with AR to measure room floor space and determine the **maximum occupancy without violating COVID-19 restrictions**
 - Create a QR code for prospective occupants to scan before they enter the room.
 - Upload photos, title and a description for the space
 - Track anonymous usage to help understand traffic patterns

Admin

EDIT SPACE

Name



Length

example ft

Width

example ft

Sqr ft

example w*l

Max People

Recommended

example


Manual Input

example

QR Code

Copy

Print

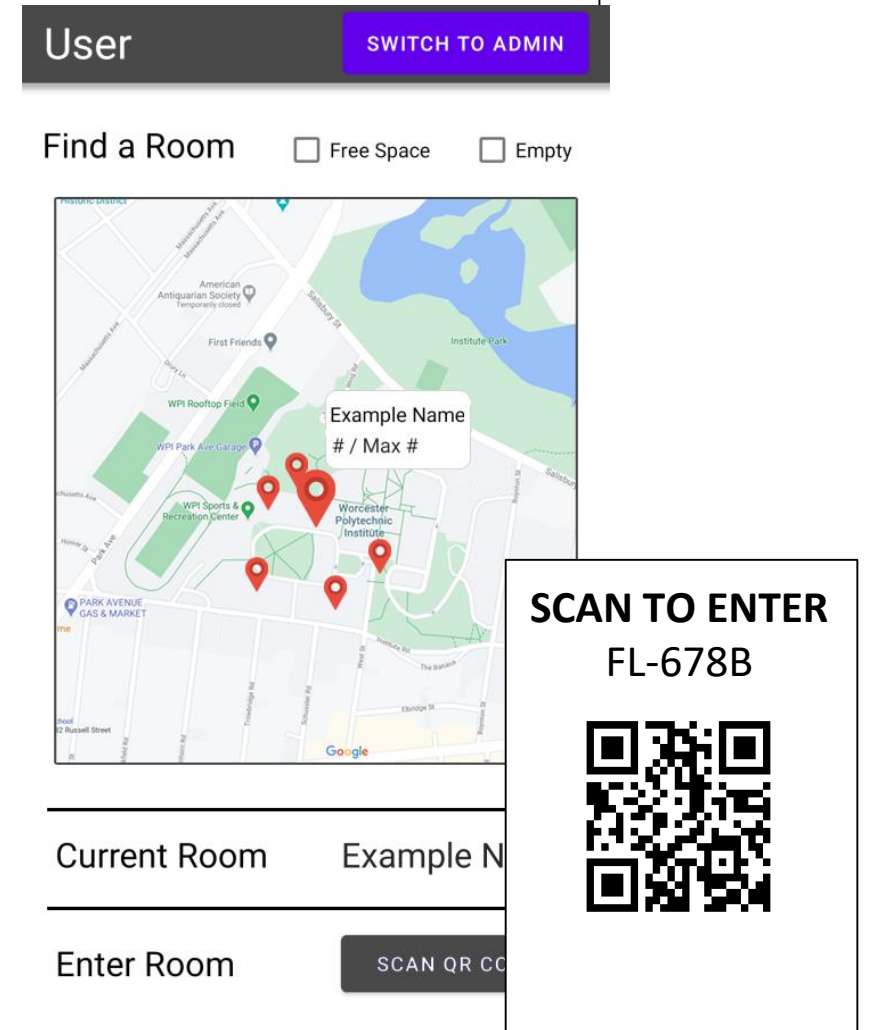


SAVE SPACE

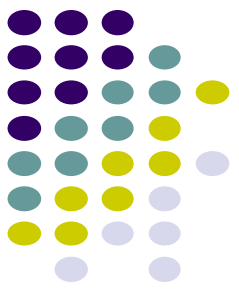
Methodology (2)

- **Students:**

- View available spaces on a map
 - Know number of available spaces before you leave!
- Access spaces by scanning QR code
 - Enforces occupancy limits with a no-contact approach
- Geofences around spaces automatically will track when you *leave*.



Implementation Plan



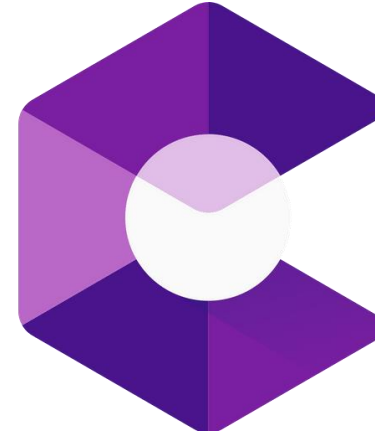
Firestore

- Database
- Save room configurations
- Track number of people in a room



Google Maps

- Set room location
- Show all rooms geographically for users
- Geofence users within a room



AR Core

- Measure distance using device camera
- Calculate the square footage of a room with measurements



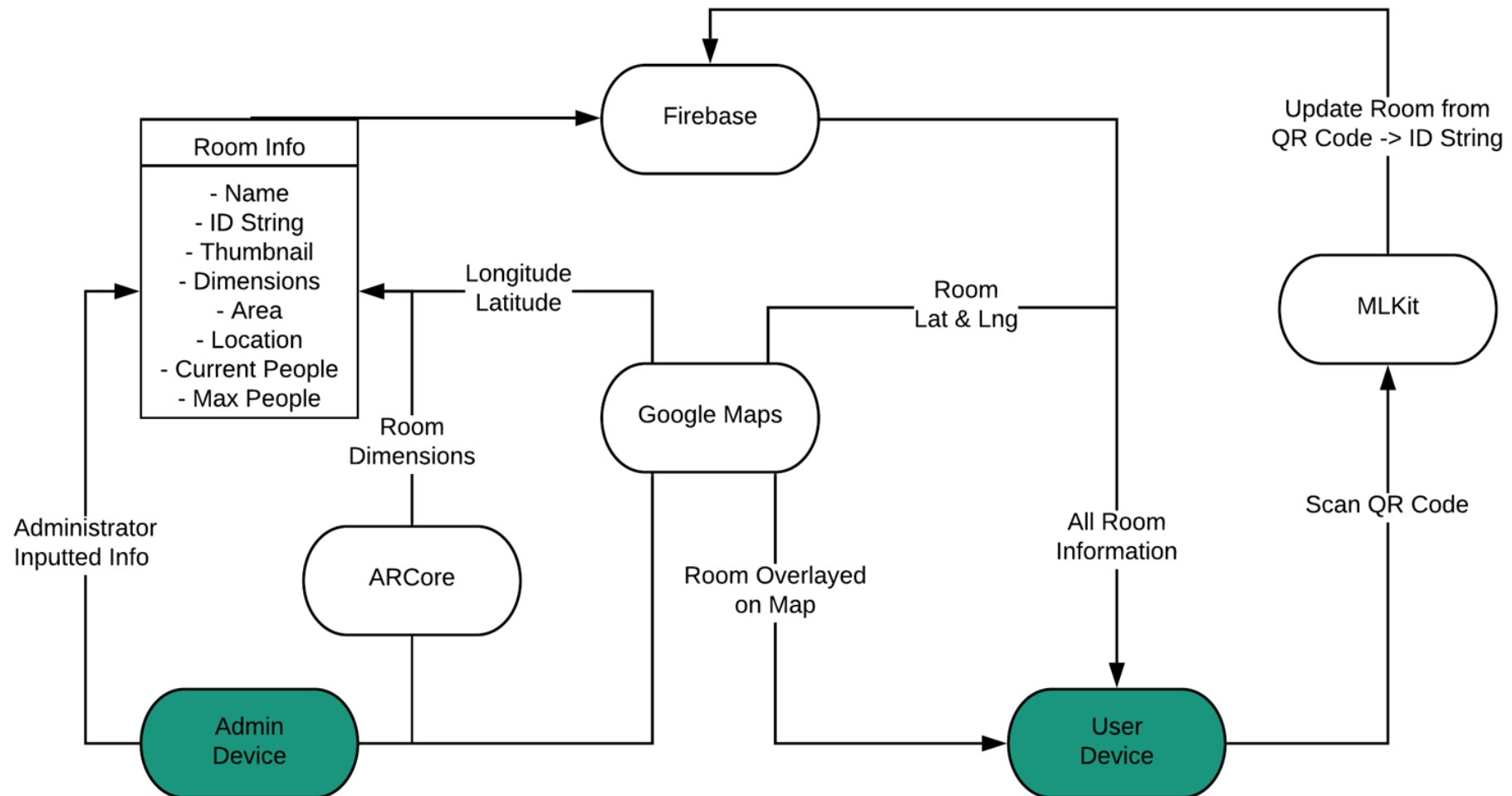
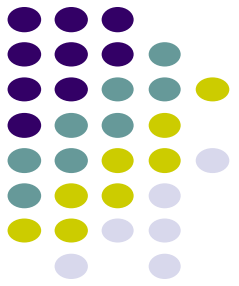
QRGenerator

- Creates QR codes for each room

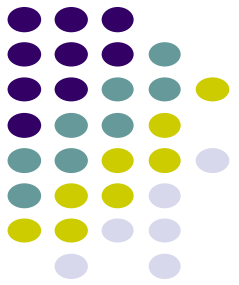
ML Kit

- Scan QR codes for users to enter a room

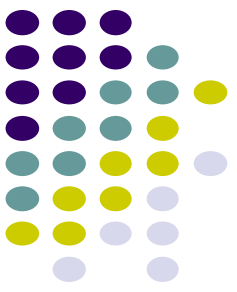
Architecture Plan



Project Timeline



Week	Deliverables
Oct 25	Prepare project proposal and create development plan
Nov 1	Set up application framework, create database, layout screens
Nov 8	View study spaces workflow, QR code scanning, and geofencing
Nov 15	Admin create study spaces workflow, photo uploading, and AR floor space calculations
Nov 22	Finish demo version of application
Nov 29	Conduct user studies, make changes based on feedback
Dec 6	Prepare final submission & Present report



Evaluation Plan

- We plan to test our application by recruiting students on campus to use our service throughout campus
 - This will get us feedback from the actual users that would download our app
- Efficiency will be evaluated by how quickly it can update availability, space capacity per room, and how accurate the geo-fencing can recognize rooms nearby each other

Difficulty Points



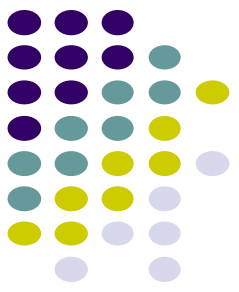
Difficulty Level 1

- Maps
- Location Sensing
- 5 Screens (2 viewfinder-based screens)

Difficulty Level 2

- GeoFencing
- Mobile Vision API: QR Code Reading

References



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