

Study Space Availability

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Introduction

The Study Space Availability project stems from an effort to help alleviate a campus wide concern regarding study space availability.

- When developing a solution the project group found that the library was the most occupied study space by students.
- The library also had the issue of students not being able to find a place to sit due to people leaving their belongings on the tables which they were not present.
- The project team intends to create such a system by installing cameras in the library that will perform image processing on the tables.
- The images are processed and used to detect for human and objects and this data lets us determine if the table is empty.
- The status of the table is then uploaded to the web page.

Design

The user can check which seats are available by logging in on our web app using their UOIT email and password. The web app can be accessed through a computer or smartphone using the web browser. The human and item detection system will detect if there is a user sitting at a specific table using Google Cloud Vision by classifying the images.

The final design consists of:

- User Application – Django web app that allows students and staff to log in and check library space availability by fetching the information from the Firebase Database.
- Admin Application – Allows admin to change sensor settings such as current floor and section where the Sensor is located in the library and notification for item detection
- Human detection – the system checks if there is a person sitting at the table and updates to the database
- Item detection – detects if there are items left on the table
- Firebase Database – Synchronizes data between the web app and the detection system

Results

Sensor 1 = Human
True = Present

Human Present = Table Unavailable



Sensors	sensor1
+ Add document	+ Add collection
sensor1	+ Add field
sensor2	Status: true

Sensors	sensor2
+ Add document	+ Add collection
sensor1	+ Add field
sensor2	Status: false

Sensor 2 = Object
False = Not Present

Human and Object Present = Table Unavailable



Sensors	sensor1
+ Add document	+ Add collection
sensor1	+ Add field
sensor2	Status: true

Sensors	sensor2
+ Add document	+ Add collection
sensor1	+ Add field
sensor2	Status: true

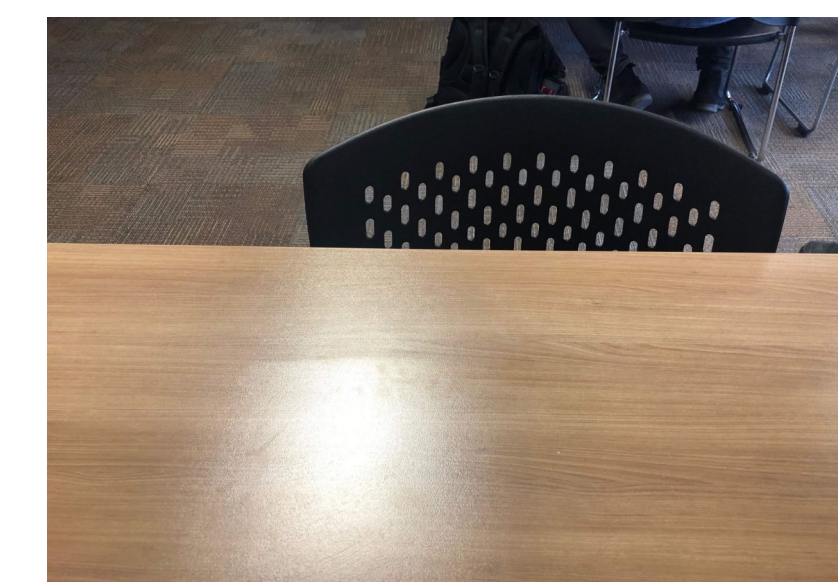
Object Present = Table Unavailable



Sensors	sensor1
+ Add document	+ Add collection
sensor1	+ Add field
sensor2	Status: false

Sensors	sensor2
+ Add document	+ Add collection
sensor1	+ Add field
sensor2	Status: true

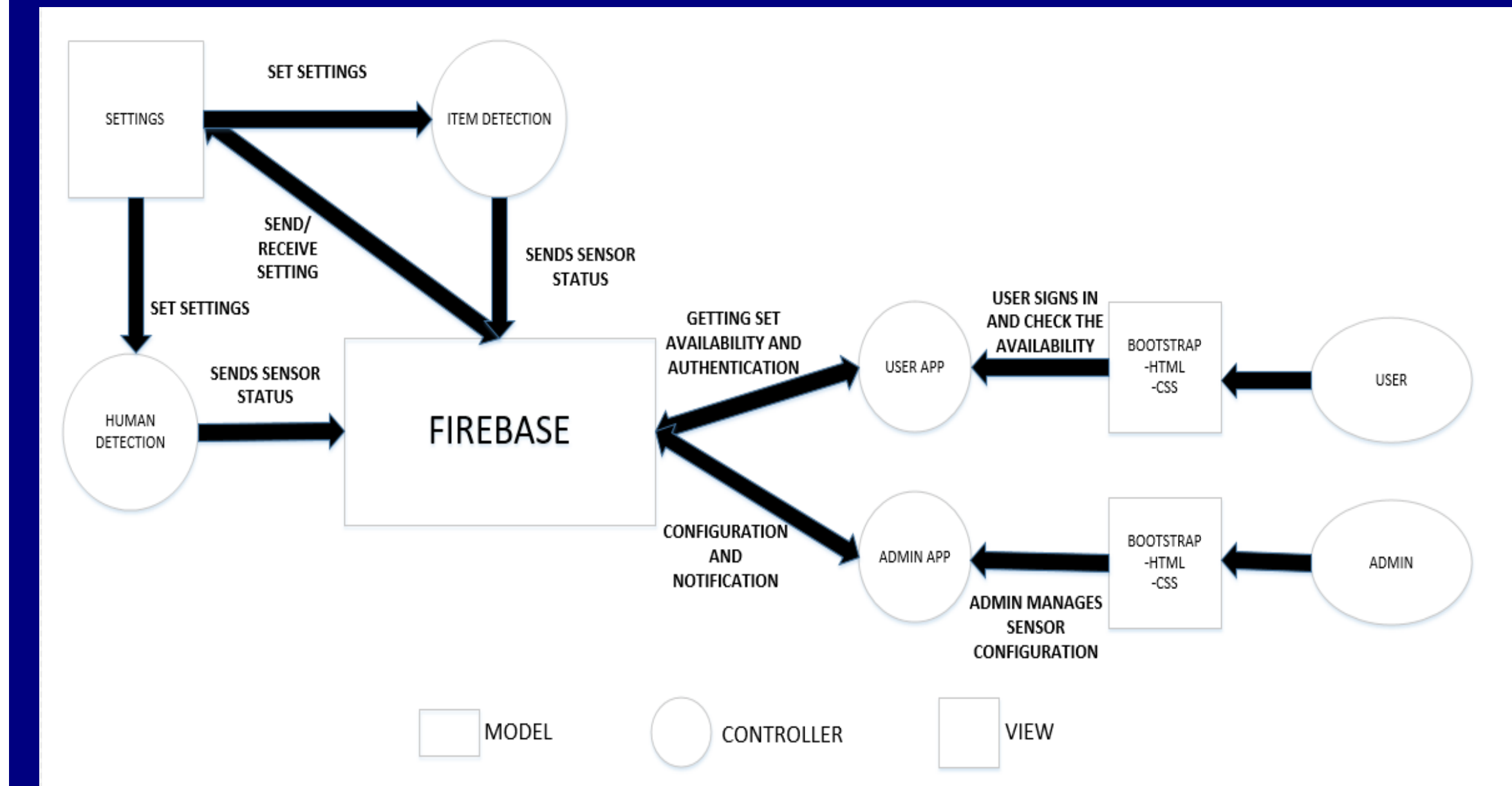
Human and Object not Present =
Table Available



Sensors	sensor1
+ Add document	+ Add collection
sensor1	+ Add field
sensor2	Status: false

Sensors	sensor2
+ Add document	+ Add collection
sensor1	+ Add field
sensor2	Status: false

System Architecture



Future Work

Future work:

- Improve accuracy of human and item detection.
- Librarian email notifications for when changes happen
- Charts that show library peak hours by gathering statistics based on seat availability
- iOS and Android Application
- Map that shows specific seats and their availability status

Acknowledgements

We would like to thank Dr. Ramiro Liscano for assisting and guiding our group throughout our Capstone Project. Without the help of Dr. Ramiro Liscano this project would not be possible.

We would also like to thank UOIT for giving us this opportunity to work on and explore a project like this which allowed us to expand our knowledge beyond the course work.