OnSight: Navigational Aid for VIs

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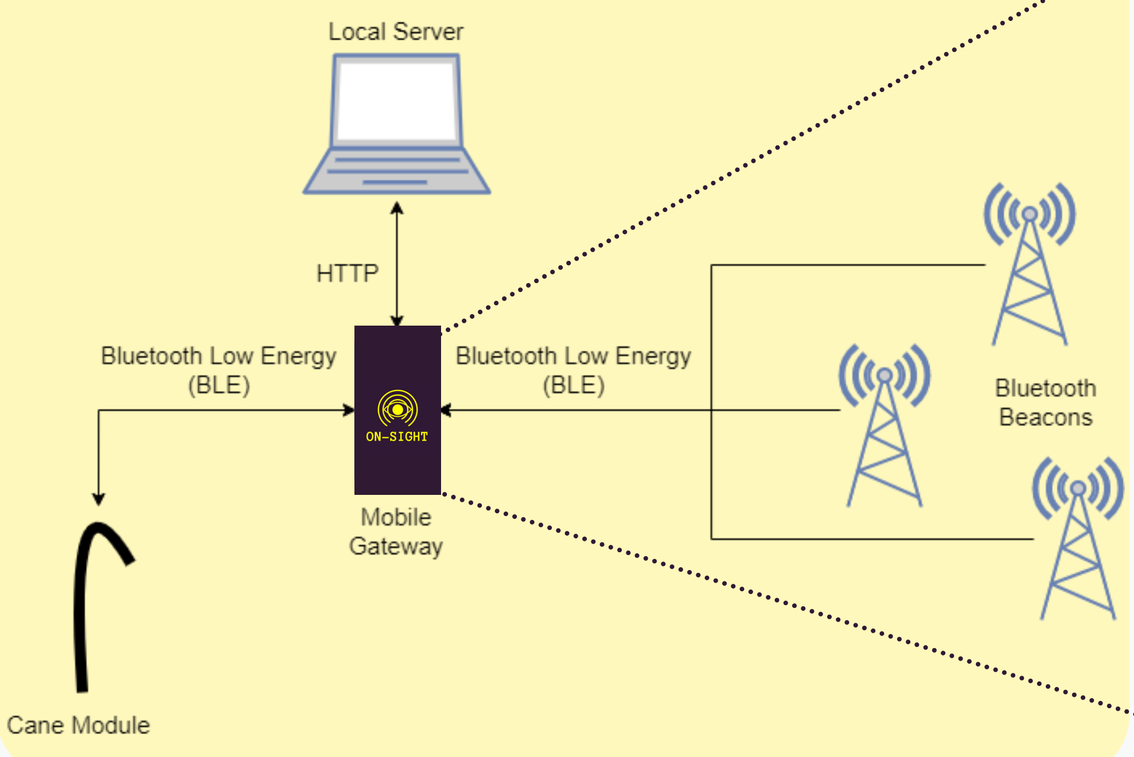
ABSTRACT

Outdoor navigation has seen major advancements in map applications throughout the years. However, there are still significant limits in terms of indoor positioning capabilities. This is evident in the case of the visually impaired (VI) in Singapore, particularly in eateries. As a result, our team has looked into existing localisation algorithms to create an indoor positioning system using a mobile application. Our goal is to provide more convenience for the VIs to navigate around eateries by utilising an attachable module for those who need to use a white cane to get around. As a result, OnSight was born: an indoor navigational help system for the VIs around eateries.

SYSTEM ARCHITECTURE



TOOLS USED

Flutter

AWS DynamoDB

Fusion 360

ESP32

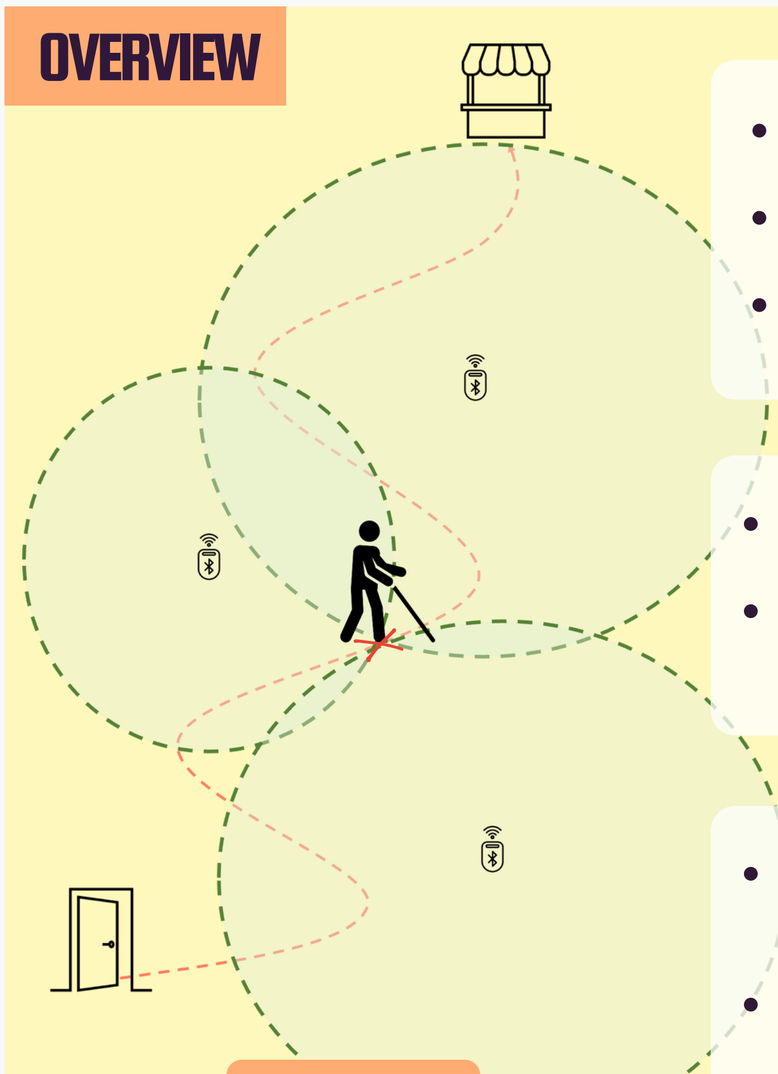
Raspberry PI

TARGET AUDIENCE

Severe Visual-Impairment
Visual Acuity: 6/60 to 3/60

Complete Blindness
Visual Acuity: < 3/60

OVERVIEW



Mobile Application

- Constantly scans for nearby BLE beacons for RSSI signals
- Allows users to customise their preferences and dietary restrictions
- Allows storeowners to add their store menu

Cane Module

- Receives navigational information from the phone
- Translates navigational information to haptic feedback which guides the visually impaired

Trilateration

- The RSSI values of the signals received are converted into distances using the Log-Distance Path Loss Model
- Estimated positions are calculated based the RSSI received and known beacons' positions
- Estimated positions will be converted to zones

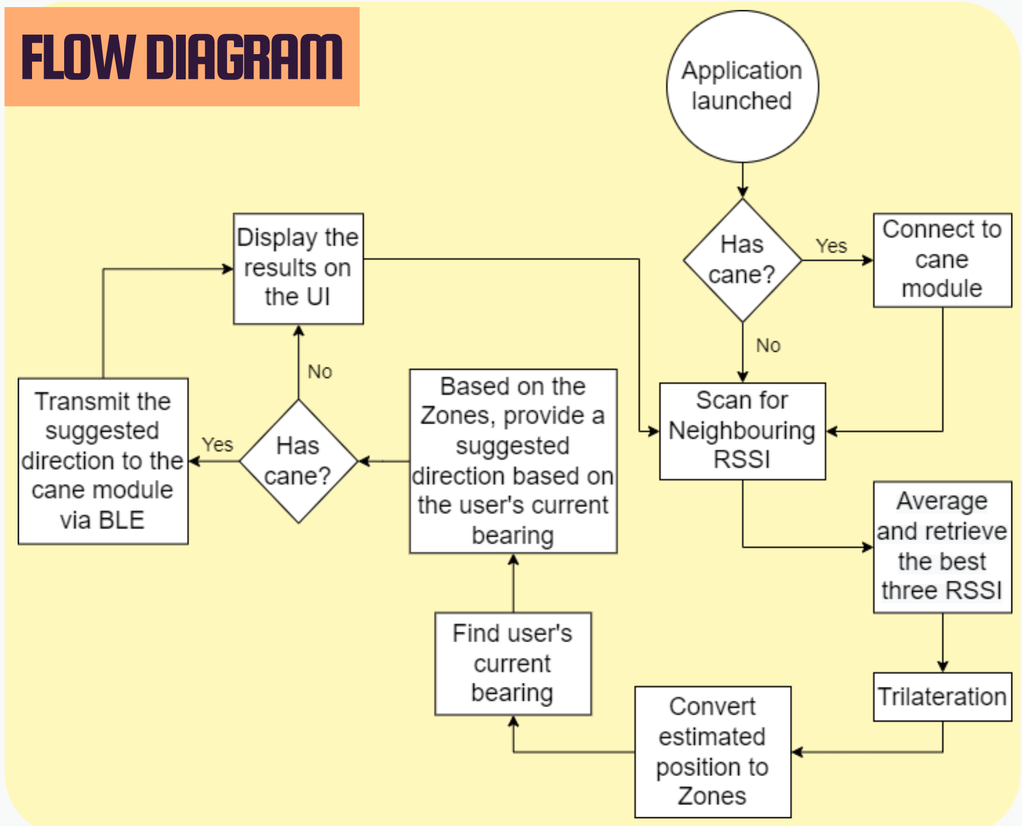
Navigation

- The indoor premise is split into zones
- The user is supposed to walk in the pre-determined directions based on their zones
- If the user has a cane, it will transmit the suggested direction to the cane

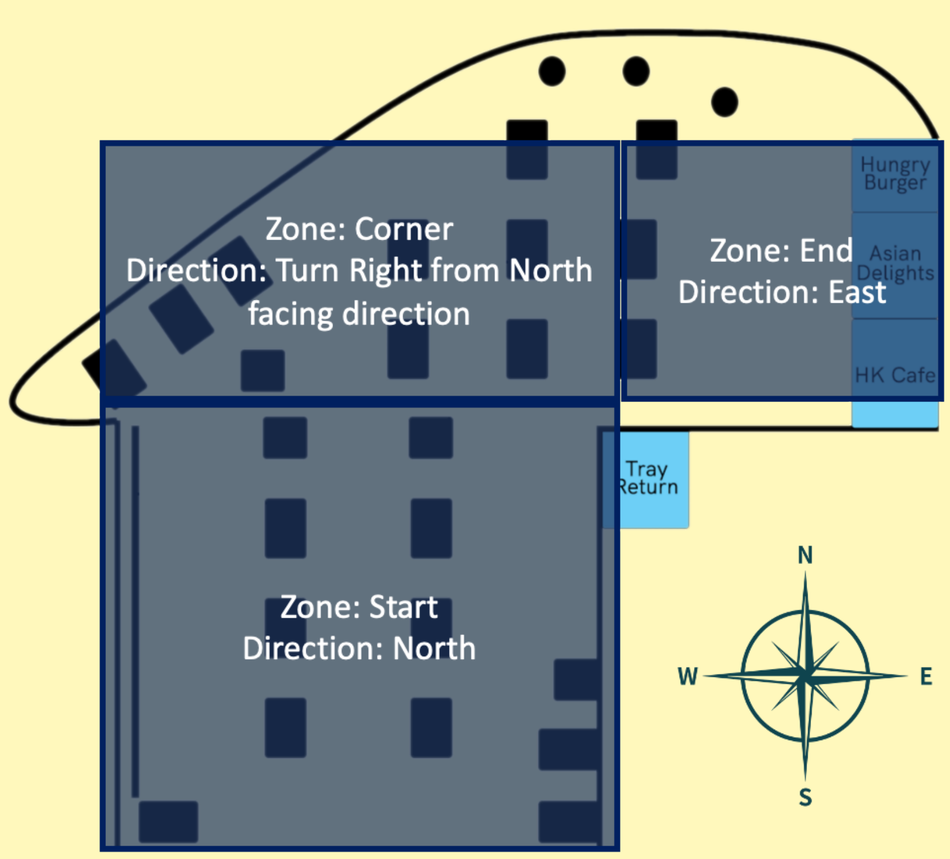
BLE Beacons

- Constantly emit Bluetooth Low Energy (BLE) signals for the app to pick up
- Placed around the eatery for adequate coverage

FLOW DIAGRAM



ZONING



CONCLUSION

Overall, OnSight is a system that was created to help the VI have an improved experience at eateries through increased accessibility and convenience. While it is not a perfect solution yet, it is a massive step taken in ensuring that individuals with such challenges are not severely limited when performing even the most mundane of tasks such as food ordering. The team has also continuously and extensively searched for ways to improve the system design with the VIs in mind.

Supervisors: Dr Chua Dingjuan, Mr Fu Yongwei