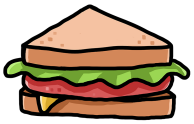

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Hardware Research: Real-time Fire Escape Route

by ERP

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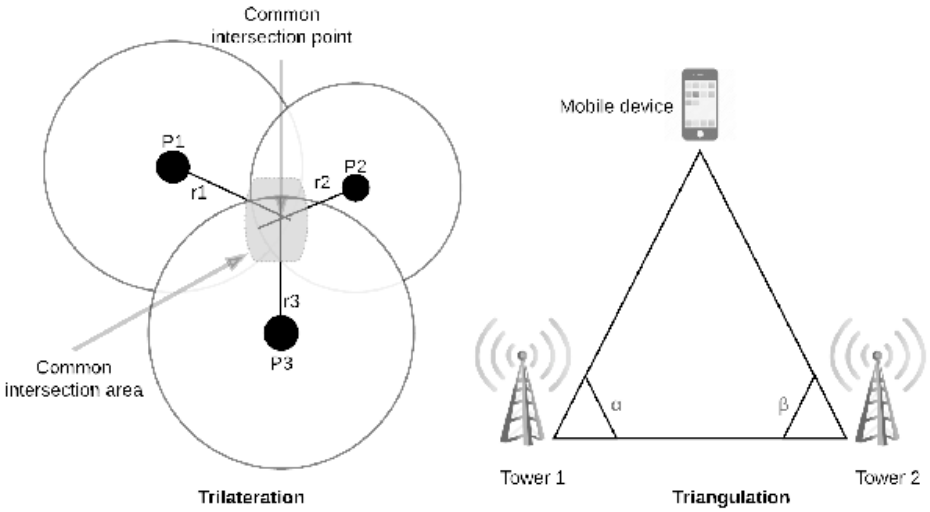
Contents

1 Introduction

This document is to serve as a guideline on what hardware would be suitable for the Real-time fire escape routes system. Only the aspects of the hardware which are applicable to the system functioning will be examined.



2 Technologies

2.1 Wifi

Depending on the Method of tracking accuracy generally ranges between 2m to 4m and with very specialized antennas reaching and accuracy of up to 0.6m.

Advantages

- Most buildings already have a Wifi infrastructure in place.
- Wifi on devices are usually enabled, thus it does not need to be enabled during a process.

Disadvantages

- Low accuracy of 2m to 4m, which can result in the system incorrectly identifying a users position.
- Wifi technologies can be more expensive to install when they are not already in place.

Limitations

- Depending on the device the range varies between 10m and 100m.
- It may be needed to add more access points so that devices can better triangulate their position.

How the technology works:
Due to the expensive cost and expertise needed for these antennas we will be using a more general Wifi approach for tracking by making use of RSSI information to trilaterate a device's position by calculating the estimated device position relative to the known position of access points. In short the strength from a Access point to a device is measured to determine its distance from it.

2.2 Bluetooth Low Enegery (BLE)

Due to the high range of beacons accuracy using trilateration can vary from **Advantages**

- Simple and easy to set up

Disadvantages

- The majority of people don't have bluetooth on during everyday use.
- Walls cause more interferance to BLE than wifi.

Limitations

- Depending on device has a range of 5-80m

How the technology works:
The location of a user is determined by assigning a probability weight to each point in the map. After calculating the expected signal strength and the measured signal strength, the location of the device is determined with great accuracy using trilateration.

3 Hardware

3.1 Raspberry Pi

Hardware capability
Wifi 2.4ghz/5ghz
bluetooth
Support for add-ons
Justification
We can easily customize software or add on additional hardware such as heat sensors, or stronger bluetooth/wifi antennas
Price
1 for R905.90 (includes essentials)
1 for R557.90 (Board only)
Online stores
https://www.pishop.co.za/store/raspberry-pi-boards/raspberry-pi-3-model-b-plus https://www.pishop.co.za/store/raspb
pi-3-model-b–black-one-nine-case-essentials-kit-boxed

3.2 iBeacon / Bluetooth beacons

Hardware capability
bluetooth 0.15m - 80m
Justification
ease of use in setting up. higher accuracy than wifi
Price
3 for $78 without batteries
Online stores
https://www.beaconstac.com/buy-beacons/indoor-proximity-beacons

4 References

https://en.wikipedia.org/wiki/Wi-Fi_positioning_system
https://blog.beaconstac.com/2018/08/ble-made-simple-a-complete-guide-to-ble-bluetooth-beacons/
https://proximi.io/accurate-indoor-positioning-bluetooth-beacons/