Project On IndoorLocalization

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Introduction

An indoorlocalization system is a system to locate objects or people inside a building using radio waves, magnetic fields, acoustic signals, or other sensory information collected by mobile devices.There are several commercial systems on the market, but there is no standard for an indoorlocalization system.

Indoorlocalization systems use different technologies, including distance measurement to nearby anchor nodes (nodes with known positions, e.g., WiFi access points), magnetic positioning, dead reckoning. They either actively locate mobile devices and tags or provide ambient location or environmental context for devices to get sensed.The localized nature of an Indoorlocalization systems has resulted in design fragmentation, with systems making use of various optical,radio,or evenacoustic technologies.

System designs must take into account that at least three independent measurements are needed to unambiguously find a location (see trilateration). For smoothing to compensate for stochastic (unpredictable) errors there must be a sound method for reducing the error budget significantly. The system might include information from other systems to cope for physical ambiguity and to enable error compensation.
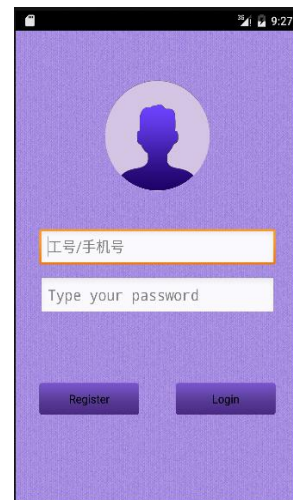
Project progress

In our project,there are three parts combined with WiFi RSS,BLE and DeadReckoning.The name of our project is FindMe. Here are the main function of our app.
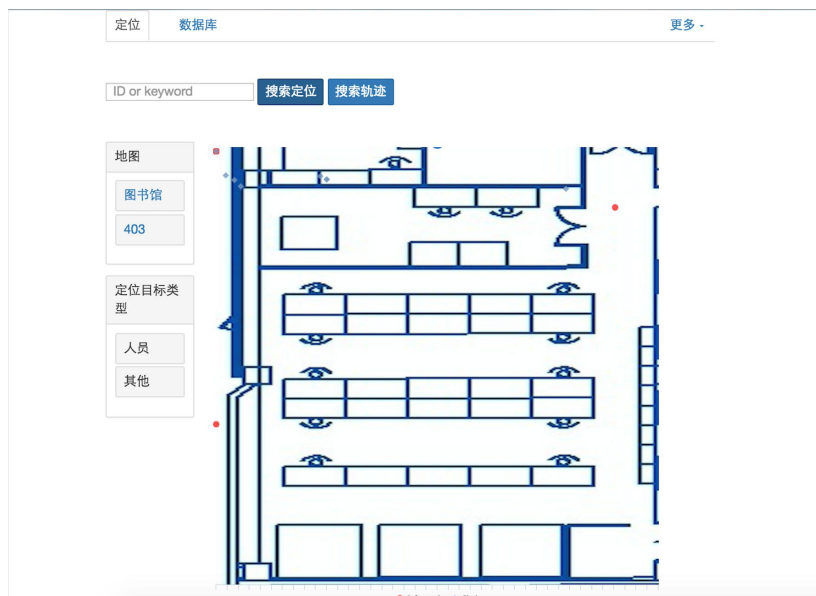

Realtime Localization

Search Friends

Login & Register

Show User's Location on server side

Dead-reckoning

We use the Motion sensor of smartphones,including accelerometor,gyrometer, and magnentometer.The accelerometer can tell whether a person is walking , and the gyrometer, and magnentometer tell the derection user are walking to.With the function of Dead-reckoning,we can localize user's position roughly.
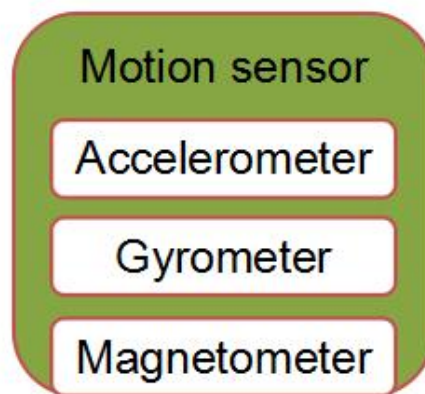

BLE Anchor with Dynamic Threshold

The second progress we made is that we improve the algorithm of BLE Anchor with static threshold to dynamic threshold which can solve the "Jumping Anchor" problem and enhance the accuracy of Dead-reckoning efficiently.

The main idea of this algorithm is as follows.

Step 1.The Dead-reckoning function localize user to the green estimated location with error.

Step 2.BLE Anchor with Dynamic Threshold algorithm will assign different threshold to different BLE Anchor respectively.And ccording to the core function of the algorithm,the further an Anchor from the real user location,the threshold of the Anchor is higher,which means it's more "difficult" to fix the location result with that Anchor's Location.

Step 3.The estimated location will be relocalized into the Anchor's position with satisfied threshold.
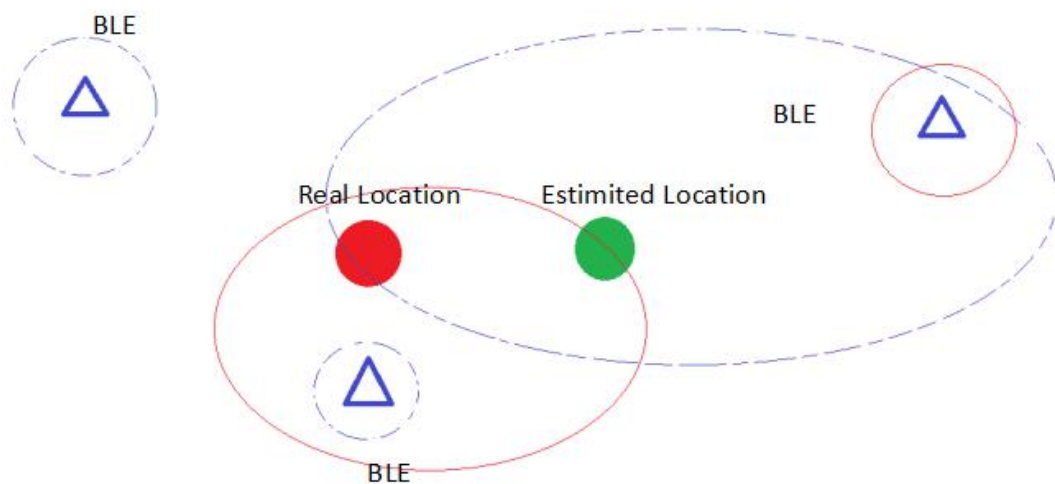
Localization Algorithm

The following is the detail of the complete datagram of the Localization Algorithm.
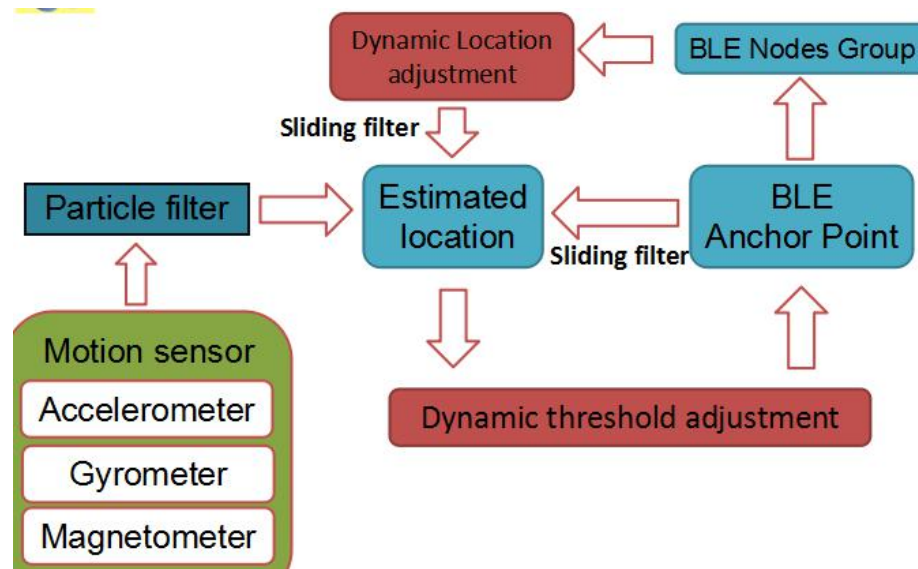
Precision of localization

We set our experiment in Foxconn Company and do the test to get the following result which is much better than before.

☐ **85%-95% with accuracy within 2m**

✓ First Test: 93%

✓ Second Test: 86%

✓ Third Test: 88%

✓ Forth Test: 91%

Problems to be solve

We still have some aspects to improve as follows.

☐ BLE signals decrease through big obstacles

☐ Wi-Fi localization isn't accurate enough

Thanks

Thanks for Pro.Wang and Pro.Tian's help and our teammates' working.We finally finish it!Thank you all again.