RSSI Based Indoor Localization using RF Beacons

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Abstract

This idea proposes the deployment of an infrastructure which consists of RF beacons interfaced with mobile application. It provides the tracking and localization of a person or an object on the floor map. The number of RF beacons depend upon the size and geometry of the subjected floor. The target person has our mobile application which shows his/her location on floor map at real time.
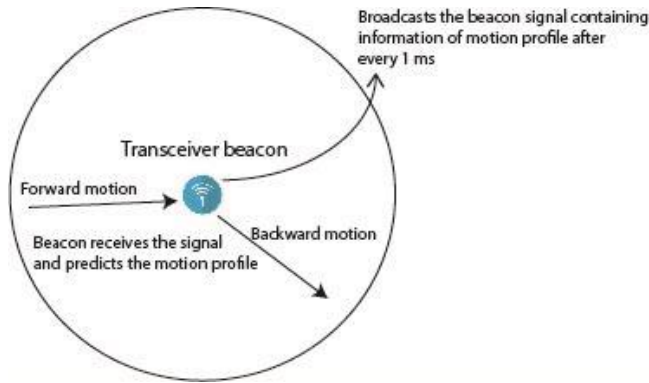
Figure 1: Beacon explained

The RF beacons as shown in Fig. 1 are installed at the optimal points on the floor and they have mutually exclusive connection with each other. They are transceivers in nature and receiving part in them is used to acquire the information about the type of motion occurring in their localities. This information is broadcasted. It is received on the mobile application and along with the RSSI data, location is determined on the map.

USRP B200 are used as the transceivers which transmit signals, which are almost same as that of beacon signal of Wi-Fi access point. They transmit the beacon signals after every 1 millisecond. Amplifiers are used to ensure the transmit power of the beacon devices to be almost 20-30 dBm.

Receiving part of the transceiver receives the echoes from the moving object as well as pure echoes. Using the beforehand training model based on deep learning, these directional receivers predict information about the type of motion, i.e., forward or backward motion with respect to the receivers. This information is transmitted along with the beacon signal from every transceiver.

A smart device which a target person carries receives signals from every installed beacons and uses the RSSI along with the motion profile information of all the transmitters for localization purpose as shown in Fig. 2.
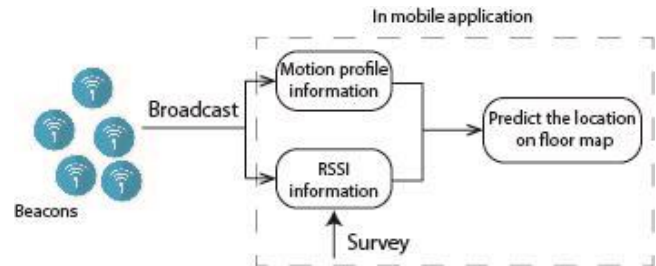

Figure 2: Block Diagram

RSSI model requires precise survey of the targeted floor beforehand [1] which develops the RSSI contours of each beacon device on the floor map which is utilized for the point-based localization. It almost takes 30-40 minutes for average building[1] survey.

Mobile application shows the entire floor map on its main interface and also its position with a red dot as shown in Fig.

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[1] 5000-6000 sq. ft. area

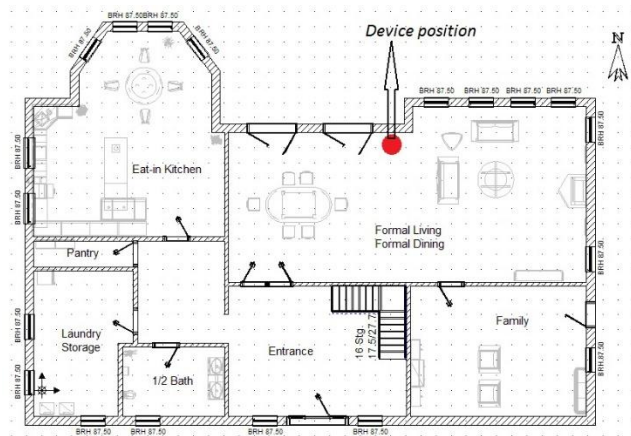3. This application is used for the survey purpose and then during the actual localization process also.

Figure 3: Sample floor map[2]

Development Requirements

Each beacon is made up of items as shown in Table. 1.

S. No.	Items
1	USRP B200
2	Antennas
3	Amplifier
4	Power Supply
5	Microprocessor

Table 1: Items required for beacon device

Mobile application must be allowed the access to Wi-Fi.

References

[1] D. Zhang, F. Xia, Zhuo Yang, Lin Yao, Wenhong Zhao, "Localization technologies for indoor human tracking", *5th International Conference on Future Information Technology*, May 2010.

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[2] *https://commons.wikimedia.org/wiki/File:Sample_Floorplan.jpg*