

# INDOOR MOBILE LOCALIZATION

## Abstract

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With the development of the wireless communication technology and intelligent mobile phone, the positioning services based on Wi-Fi and mobile phone are increasingly demanded. In this paper, a Wi-Fi fingerprint localization method is proposed on the basis of important access points (IAP). For the Wi-Fi fingerprint, Wi-Fi access point with the highest received signal strength (RSS) is denoted as the important access point. At the localization stage, the fingerprints are chosen with the same IAP as the estimated fingerprint from the database. Then, the distance and the AP repetition of the fingerprints are used to calculate the similarity degree. The location of the fingerprint which matches the estimated fingerprint well can be regarded as the estimated location. Experimental results show that the proposed algorithm can achieve high accuracy in indoor environment.

Here we are implementing an android app for guiding a blind person to navigate the entire mall using indoor localization.

## Introduction

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With the rapid development of mobile communication and the pervasive computing technology, the requirement of obtaining location-aware service is rapidly increasing. Though Global Positioning System (GPS) can provide accurate and reliable position information for location services, it cannot be used effectively under indoor environment. To overcome this limitation, researchers have proposed many creative localization technologies such as sensor network, RFID, and Wi-Fi. Among them, Wi-Fi positioning technology has attracted extensive attention because it is built upon mobile phones, which are used widely all over the world. The crowded places, such as street, office buildings, shopping malls, hotels, and airports, usually have a lot of AP hot spots, which form a wide coverage of Wi-Fi network. Therefore, it is feasible and practicable to adopt the Wi-Fi network and mobile phone to implement personnel positioning under indoor environments.

Wi-Fi-based indoor positioning can be divided into two categories according to the working basis. One consists of the localization algorithms based on signal propagation model. The other includes those algorithms based on position fingerprint. The former uses the signal propagation

model to convert measured signal strength into distance information. Then, the target coordinates can be calculated according to the distance between the moving target and the multiple access points with known coordinates. To accomplish that, it is necessary to perform coordinate planning on the areas to be localized and accurately obtain the coordinates of Wi-Fi access point. For ordinary multistory building, the actual deployment of Wi-Fi access points is irregular, since it is seriously influenced by some factors such as the building structure. Thus, it is very complex to fulfill the establishment and calculation of the AP coordinates. At the same time, in the procedure of signal transmission, Wi-Fi signal is vulnerable to environmental factors such as walls, doors, and windows, even the movement of people. Besides, the degree of attenuation is closely related to the obstacles' shape, size, and material. Therefore, in the indoor environment with complex structure, the signal propagation model cannot accurately describe the relationship between actual distance and the signal strength.

The algorithm of fingerprint localization mainly consists of two parts, including offline establishment of location-fingerprint database and online positioning. At the stage of database establishment, some appointed locations in the building are sampled. A collection of Wi-Fi signals and their intensity will be recorded and considered as position fingerprint. At the stage of online positioning, fingerprint information is collected around the position to be localized. Compared with fingerprints in offline database by matching strategy, the position whose fingerprint can attain the best match is chosen as the final estimated position. In contrast, although the Wi-Fi fingerprint-based positioning technology needs to make fingerprint database at the early stage, it can effectively avoid the influence of building structure. Furthermore, fingerprint-based methods do not require that Wi-Fi access points are known beforehand. Therefore, it has a higher practicability.

This paper proposes a Wi-Fi fingerprint-based positioning algorithm with important access points to estimate the position of mobile phone by analyzing the experimental test of indoor Wi-Fi signal. The proposed algorithm does not require the environment layout and additional equipment. Compared with classic fingerprint localization algorithm, it effectively reduces the computation load and can obtain high localization accuracy.

## About Existing System

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There's no versatile system in our current scenario to perform different tasks such as Indoor navigation, Shopping, Cab booking in a localized area like shopping Mall. In the current System all tasks are to be done manually, i.e. products in the shop can't be known by the people. For knowing this information they want to go for a shop and search for it. It takes so much time for getting correct product which user has desired. His/her valuable time is wasting. The shop owners also take great effort by taking different products. Sometimes it will not be impressed by users. Thus his/her time will be wasted.

## About Proposed System

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The system is versatile and is intended for mobile localization for the customers and visually impaired persons. Voice based techniques are included for alerting the user. The system mainly contains,

1. Locally hosted website
2. Android application

Shops are registered in the website. They can add their products, product offer using the site portion. Hot spot registration and shop assigning is done by the admin.

The blind persons need to install the application for navigation support. The user can launch the application by pressing the volume button.

Merits:

- No need for GPS
- Positioning is accurate
- Low cost for implementation

## SYSTEM SPECIFICATION

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Hardware and software requirements for the installation and smooth functioning of this project could be configured based on the requirements needed by the component of the operating environment that works as front-end system here we suggest minimum configuration for the both hardware and software components.

Working off with this software is requirements concrete on system environments. It includes two phases

- Hardware requirements
- Software requirements

- ***Software Requirements:***

- *Operating system* : *Windows 8 or above, Android*
- *Technology Used* : *Python*
- *IDE* : *Netbeans 8.0.1, Eclipse Indigo / Android Studio*
- *Database* : *MySQL*

- ***Hardware Requirements:***

- *Processor* : *32 bit*
- *RAM* : *Min 1 GB*
- *Hard Disk* : *10 GB*

## Modules

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The following are the modules in this application.

- Mall Manager
- Shop Owner

- Customer
- Blind customer

## 1. Mall Manager Module

Mall manager is one who manages the entire working of a system. Following are the main functions that can be performed by the Mall manager:

- **Add floor:** Mall manager can add the details of the floors in the mall.
- **Approve shop request:** mall manager can approve the shop requests
- **Add vacant space details:** mall manager can add the details of the vacant spaces in the mall.
- **Add events:** mall manager can add event details.
- **Assign Wi-Fi settings:** mall manager can assign the Wi-Fi settings to the shops in the mall
- **Add reply to complaints:** mall manager can add reply to the complaints from the shop owners.
- **View:** mall manager can view the shop requests, view complaints added by the shop owners ,ratings from the customers

## 2. Shop owner Module

Following are the main functions that can be performed by the shop owner:

- **Add product details:** the shop owner must add the product details after the request is accepted by the mall manager.
- **Add offers:** shop owner must add the offers of the products after entering the product details.
- **Add complaints :**the shop owner can add complaints
- **View:** the shop owner can view the carts of the customers, and approve the orders of the customers, view reply from the mall manager for the complaints and view the event details

## 3. Customer Module

The functions performed by the customer are:

- **View:** customers can view the shops in the mall, the products available in the shops, the offers related to the products, event details, and the reply from the shop owners for the enquiries.

- **Add products to the cart:** the customers can add products to the cart
- **Add enquiries about the product orders:** customers can add enquiries about the status of their orders.
- **Identify nearby shops and offered products and offers**
- **Cab Booking:** customers can call taxi, auto etc.

#### **4. Blind Customer**

- **Audio based indoor navigation**