

## **Mall Navigation System Using WI-FI Router**

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### **Abstract**

*There have been various navigation and tracking systems being developed with the help of technologies like GPS, GSM, Bluetooth, IR, Wi-Fi and Radar. A shopping Mall is a vast place, & we often get confused with the direction of the nearest ATMs or even rest rooms. So we have simplified this method with the “Mall Navigation System”. Smart phones have become very popular these days, so we have combined the idea of a smart phone application helping you in an alienated mall. The idea revolves around our smart phones & the “WI-FI” provided by the mall. An application that needs real-time, fast, & reliable data processing. The WI-FI router will install NAVIGATION software by which it will detect our present location and with a view finder & our maps we detect the desired location.*

### **Keywords**

*Wi-Fi-based positioning system (WPS), Wi-Fi Router, Navigation software, View finder, Map, Wireless Sensor Network (WSN)*

### **1. Introduction**

The concept of Wi-Fi Navigation is very simple despite the technicalities of the underlying hardware. The most important part to the system is a database located on the mobile device with a predetermined list of wireless access points in a defined area with corresponding longitude and latitude coordinates. With the large scale expansion of Shopping mall, corporate offices, and all sorts of commercial and non-commercial buildings, precise positioning has gained lot of importance not only to save time but also to get rapid access to everybody everywhere. There are a lot of organizations which have some restricted areas which they would like to make accessible to only a few people, this facility can also be provided by such navigation systems. Protecting secured networks from intrusion or maintaining a record of all the movements of the network assets are some other advantages of these systems. Although such navigation systems have

such varied applications but the most commercially viable ones in the present scenario are those which make use of the existing wireless infrastructure so as to reduce the equipment and installation cost considerably. Wi-Fi tracking seems to be a plausible solution and significant work has been done in this regard though there are a lot of drawbacks associated with them.

The system introduced in this paper is based on most popular wireless technologies namely Wi-Fi Router using Navigation Software. The sole motive of using Navigation Software usually provides maps and directions to help you get to your destination based on your current location.

Some sophisticated navigators even provide voice instructions for turn-by-turn directions. Now a day's Navigator systems usually find in everyone's Smart phones and is designed for low power consumption. Moreover, we make sensor networks different from other well-established communication wireless ad-hoc or mesh networks such as WLAN (Wide Local Area Network), which are based on a fixed network infrastructure, unattended and self-organizing. These so-called wireless ad hoc and sensor networks open a wide range of communication and applications in the idea of mesh networking is not new but has been suggested for some time for wireless Intra/Internet access or voice communication.

Nowadays shopping malls provide free Wi-Fi services so as the visitors are able to access free internet on the go within the mall itself and keeping in mind business strategies the mall database automatically sends advertisement links. Along with the same service the mall also provides its own navigation system.

Similarly, as we enter a shopping mall and in order to access free internet we search for the Wi-Fi connection of the place through our smartphones, when our phone detects the router; the router sends a downloadable map of the mall with the help of wireless radio transmission. After the map gets install in our smart phone, it locates our current position, & allow us to navigate using a view finder.

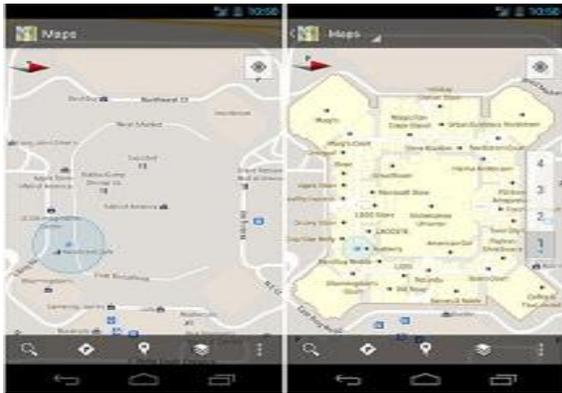


Figure 1: Map inside a shopping mall.

## 2. Wi-Fi-based positioning system (WPS)

Wi-Fi-based positioning systems (WPS) are designed to support the acquisition of accurate location information with technology other than Global Positioning System (GPS). These systems have the potential to supplement GPS where GPS is unreliable, specifically, indoor environments. Recently, Location Based Services (LBS) have become increasingly popular for many mobile device users. These new mobile devices incorporate various wireless technologies, such as Wi-Fi, A-GPS, Bluetooth, and GSM. While each of these technologies contributes to the integration and development of LBS, Wi-Fi has been most widely employed as an alternative positioning service. Indoor location uncertainty with Wi-Fi stems from utilizing an unreliable database for wireless router locations and not fully utilizing and correcting received signal strength. Furthermore, database information is often collected using unreliable and unsecure methods. The purpose of this study is to validate the advantages of using a reliable database for a Shopping Mall (a Large area WPS) from indoor environments.

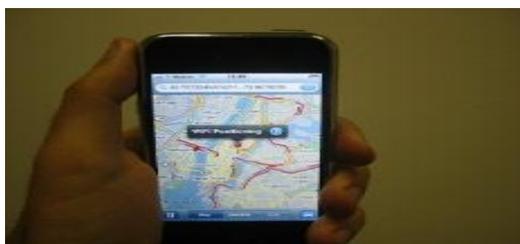


Figure 2: WPS

## 3. Wireless Sensor Network (WSN)

WSN is an emerging technology, which has revolutionized the data collection in real time from the field (location), which will help to improve the decision-making process to a large extent and help user to draw contingent measures in real-time manner. WSN system is a traffic management and real-time navigation information in Shopping Mall.



Figure 3: Wireless Mesh Network (WMN)

A wireless mesh network (WMN) can be seen as a special type of wireless ad-hoc network. A wireless mesh network often has a more planned configuration, and may be deployed to provide dynamic and cost effective connectivity over a certain geographic area. A wireless mesh network (WMN) is a communications network made up of radio nodes organized in a mesh topology. Wireless mesh networks often consist of mesh clients, mesh routers and gateways. The mesh clients are often laptops, cell phones and other wireless devices while the mesh routers forward traffic to and from the gateways which may, but need not, connect to the Internet. The coverage area of the radio nodes working as a single network is sometimes called a mesh cloud. Mesh networks may involve either fixed or mobile devices. The solutions are as diverse as communication needs, for example in difficult environments such as emergency situations, tunnels, oil rigs, battlefield surveillance, high speed mobile video applications on board public transport or real time racing car telemetry. An important possible application for wireless mesh networks is VoIP.

## 4. WI-FI as a part of Location Based System (LBS)

Wi-Fi Positioning System (WPS) uses wireless fidelity network instead of GPS or cell tower systems or location beacons to determine position. This

consists of a nationwide access points or network of location beacons used for pinpoint measurement of user's position and is better than satellite positioning system. There are several Wi-Fi positioning software available that uses radio signals emitted from wireless routers to determine the exact position of any Wi-Fi enabled devices including PC, laptop, PDA and smart phone. The operator that provides Wi-Fi services has their own database containing information about every access points in a particular area. So when a user enter into a area then the software search for access points and then calculates the exact position of the user by selecting and comparing them to the reference database. For more accuracy, there needs to be more access points with more Wi-Fi signals.

## 5. Literature Review

In 2012 , Ankita Paul, AbhikSarkar&Rohit Das in the paper "Mall Navigation System Using Wi-Fi Router " ( ICETT2012115) proposed that with the help of a Wi-Fi router & a navigation software one can locate his position & also get the direction of his desired location inside a shopping mall.

The Mall Navigation System Using WI-FI Router presented in thesis paper as a open source and cost effective system that is designed to find out the exact location if a Shopping Mall or a Shopping Complex, which is a vast place, & we often get confused with the direction of the nearest ATMs or even rest rooms .This is an application that needs real-time, fast, & reliable data processing and information / assistance to the clients and service mobile Wi-Fi navigation system.

Wi-Fi is also used in connecting computer in the network together. By the use of emitted radio signals one can connect computers without wire anywhere in home or office. But this can be possible within a distance of 100 meters. Here, Wi-Fi enabled devices first transmit the binary codes of the computer into radio waves and then transmits it to the other computer where the attached Wi-Fi device again converts it into binary code for the respective computer.

But as its accuracy depends on the density of Wi-Fi signals or the number of routers, the technology performs better in the urban areas that have more Wi-Fi beacons. It is not popular in rural areas where access points are deployed far from each other. Again unlike GPS satellites or cell towers, the Wi-Fi routers

provide low signal strength, & perform under a limited area. As we relocate to a different place, we need to search a new Wi-Fi source.

## 6. Conclusion

The paper revolves around the idea of navigation within a mall or any commercial building using only Wi-Fi.

Wi-Fi in this case is supported by the following,

1. WPS
2. WMN
3. WSN

Making the use of WPS we get to know our precise or even exact location and as we relocate ,the view-finder supported by the same,directs us to our required destination.On the other hand WMN utilizes the mesh topologyand processes data with ease and allows us find the right place with certain logicalsteps.

WSN helps the system perform in collecting and monitoring the data/phenomena precisely and communicate without any data/packets losses. This system is developed to provide a real-time location based cost effective tracking system.

The main advantage of this system is that it does not need to have any pre-installed map , using open source map/system one can monitor location of the area in real-timemanner. Location based data/information service is also provided to view travelled path (routes) using WPS tools.

Another advantage of using such a system lies in its use of mobile phones for tracking. With the development of mobile phone apps on almost all platforms at a large scale, there is a lot of scope of adding new capabilities and features to this system. One such example would be to generate a map/path based on the location of the user and the location tracked which would further ease the process of positioning or to be more precise maps viewed at street or lane levels would become a breakthrough of such ideas dealing with navigation at Wi-Fi enabled positions.

## Reference

- [1] University of Washington, "UW Campus Navigator".
- [2] Wi-Fi, Wikipedia Encyclopedia.
- [3] Beom-Ju Shin, Kwang-Won Lee, Sun-Ho Choi, Joo-Yeon Kim, Woo Jin Lee, Hyung Seok Kim, "Indoor WiFi Positioning System for

Android- based Smartphone”, in Proceedings of International Conference on Information and Communication Technology Convergence ICTC’10.

- [4] Wilson M. Yeung, Joseph K. Ng, “Wireless LAN Positioning based on Received Signal Strength from Mobile device and Access Points”, in Proceedings of 13th IEEE International Conference on Embedded and Real-Time Computing Systems and Application, RTCSA’07.
- [5] Polycom, 2012. Business quality communication. Available at [www.polycom.asia/](http://www.polycom.asia/) Accessed on 08 June 2012.
- [6] Omar Cruz , Erik Ramos †, and MoisésRamírez, “3D Indoor Location and Navigation System Based on Bluetooth”, in Proceedings of 21st International Conference on Electrical Communicationsand Computers (CONIELECOMP), 2011.
- [7] Wireless Sensor Network (WSN) Wikipedia Encyclopedia.
- [8] IV Trace: A Cost-Effective Vehicle Tracking System-A Prototype in Proceedings of International Journal of Engineering and Technology.



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