ISSN XXXX XXXX © 2017 IJESC

IJESC

Research Article Volume 7 Issue No.5

Wi Fi Based Indoor Positioning System

Shubham Dhirde[1], Shivangi Khedkar[2], Aman Shaikh[3], Prof. Anisaara Nadaph[4]
BE Student[1, 2, 3], Senior Professor[4]
Department of Computer Science
Trinity College of Engineering and Research, India

Abstract:
Wireless IPS has become popular in recent years. IPS systems have been successfully used in many appliances such as asset inventory and tracking management. Paper describes an overview of the existing wireless indoor positioning techniques and attempts to classify different solutions. Three location estimation methods of triangulation, scene analysis, and proximity are analyzed. We have also seen location fingerprinting in detail since it is used in most current system. We examine evaluation method to survey existing systems. Performance comparisons including accuracy, complexity, precision, scalability, cost and robustness are presented.

Keywords: Indoor Position detection, WI-Fi, Trilateration Technique, Nevigation.

I. INTRODUCTION

In last few years, positioning of mobile phones has become a necessity for which a various of technologies have been used in to gain it with a good optimization.

Some of the existing systems that offer indoor localization services (IPS) use different technologies like GPS, RFID, Bluetooth, Wi-Fi, signals of cellular towers. Here we using Wi-Fi because Wi-Fi doesn't require additional infrastructure and it allows recognition of the location of each device. This solution uses Wi-Fi signals to estimate the path between the user and the transmitter. The distance was used as a radius to generate a circle around each transmitter. By intersection of the three circles, the location of the user was estimated. it will produce a unique answer If given the correct information. Another part says, when the information given is imperfect the circles generated will not intersect at a single point or will not intersect at all. There is also problem if Wi-Fi signals are variable.

II. PROPOSED SYSTEM

The system is based on a client- server architecture which can be distinguished in three main modules, the network may contains at least three or more Wi-fi Access Points, the client device which is an Android operating system or smartphone and the server In this user positioning in indoor environment, Navigation can be decide the choice of destination in the system. Using the user position coordinates and destination coordinates the system helps you to navigate.

Log-distance path loss model-
Signal strength will lost with increasing of the transmit distance. Log-distance path loss model is described as:

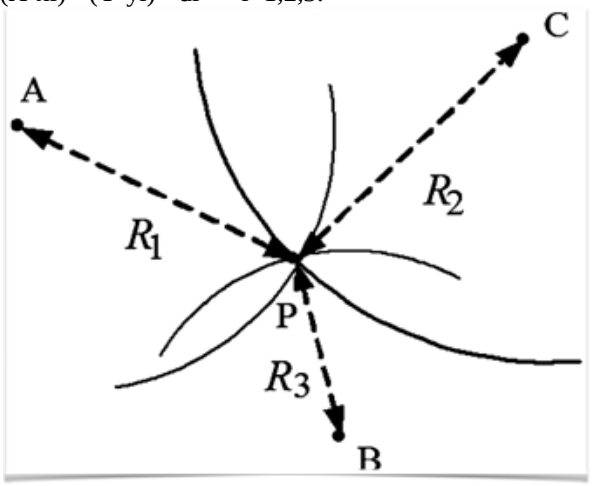
$$Pr(d) = Pt - PL(d)$$

Pr (d) is signal strength of receiver. Pt is the signal strength of transmitter, d is the transmitter to receiver distance, which is the distance between AP and user. PL(d) is the path loss of signal strength between transmitter and receiver. PL (d) can be written as:

$$PL(d)=PL(d0)+ 10.n.\log(d/d0)+ Xg$$

Triangulation Algorithm
The triangulation algorithm helps to find out the position of the target place based on geometric properties of triangles. When the device at the target place receives the WiFi signals from more than three WiFi access points, the the angle of arrival (AOA), time of arrival (TOA) and the (RSS) received signal strength (RSS) of WiFi signals will be used to estimate the distances between the target place and WiFi access points. With the position of three or more WiFi access points, the target place can be estimated by triangulation.

$(X-xi)^2+(Y-yi)^2=di^2$ i=1,2,3.



Fingerprint Algorithm-
Location fingerprints database is formed by many location fingerprints. A location fingerprint can be expressed as (MACk, AVGk, PAVGk, DEVk,ID, X, Y,) where k = 1, 2, ..., n. A location fingerprint stands for a collecting point. A points receive n WiFi signals. So a location fingerprint will contain n WiFi signal strengths. (X, Y, ID) represents the location of one collecting point. MACk stands for the physical address of the kth WiFi access point. AVGk means the average value of the kth original WiFi signal strength. PAVGk means the average value of the kth processed WiFi signal strength. DEVk means the standard deviation of the kth original WiFi signal strength.

III. SURVEY

Having identified the common measuring principles, the positioning algorithms and the important performance attributes of location positioning systems, we are able to discuss specific systems. Two basic approaches to designing a wireless geolocation system. The first approach is to develop a network infrastructure of location measuring units and signaling system and focused primarily on wireless location application. Next approach is to use an existing wireless network infrastructure to locate a target.

IV. ACCURACY

Location error is the most important requirement of positioning systems. mean distance (MD) error is considered as the performance metric, which is the average Euclidean distance between the true location and estimated location.

V. SCALABILITY

The scalability character of a system decides the normal positioning function when the positioning scope gets large. The positioning reference point performance degrades when the distance between the transmitter and receiver increases. A location system scale on two axes a) geography and b) density. Geographic scale-means that the area or volume covered. Density-means the number of units located per unit geographic area/space per time period.

VI. COMPLEXITY

Complexity of a positioning system can be featured too hardware, software, and operation factors. We emphasize on software complexity. If the computation of the positioning algorithm is performed on a centralized server side, the positioning could be calculated fast due to the sufficient power supply and powerful processing capability. Most of the mobile units lack long battery life and strong processing power so, we would prefer positioning algorithms with low complexity. It is difficult to derive the analytic complexity formula of different positioning techniques; thus, the computing time is considered. The dual of location rate is location lag, which is the delay between a reporting the new location of that target by the system and mobile target moving to a new location.

COST

The cost of a positioning system depend on many factors. Important factors include money, time, energy, space, weight as well as installation and maintenance factors. Mobile units may have tight space and weight constraints. Density consider as space cost. We also consider some sunk costs sometimes. Another important cost factor is energy. These units only respond to external fields and, thus, could have an unlimited lifetime. Other mobile units have a lifetime of several hours without recharging.

VII. CONCLUSION

For its optimizing more accurate signal propagation models can be used or expanded measures of signal strength including most number of reference point. Moreover, the further work can be continued on the Wi- Fi fingerprinting approach because the indoor localization algorithm described above may be considered as a special case of fingerprinting. The realization of fingerprinting approach requires also advanced measurement. Future scope of the system lies there in the efficient indoor navigation system which can be useful in many places. Accuracy in positioning the device and optimized the solution can be improved a lot with the combination various technologies like CCTV, LED Lights. Indoor system for user and device tracking for security reasons can also be the future scope of the system.

VIII. ACKNOWLEDGMENT

Authors are thankful to the Department of Computer Engg, Trinity College of Engineering(TCOER), Pune, Maharashtra, India, for providing the necessary facilities for carrying out this work. Authors gratefully acknowledge the support given by University Of Pune, Pune, Maharashtra, India, for carrying out this research work. Authors also grateful to Prof. Anisaara Nadaf, Trinity College of Engineering, Pune, Maharashtra for their time to time guidance and support towards carrying out the research work. Authors are also thankful to Mr. Akshay Sonawane and Ms.Kshitija Kshirsagar for influencing us to take forth this research concept and work towards its implementation and also the anonymous reviewers for their valuable suggestions towards improving the paper.

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