

A Review on User Navigation and Location Tracking System Indoor Localization for Smartphones

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ABSTRACT: Rapid development of smartphone industry, various positioning-enabled sensors such as GPS receivers, accelerometers, gyroscopes, digital compasses, cameras, Wi-Fi and Bluetooth have been built in smartphones for communication, entertainment and location-based services. Smartphone users can get their locations fixed according to the function of GPS receiver. This is the primary reason why the huge demand for real-time location information of mobile users has been unprecedented in recent years. However, the GPS receiver is often not effective in indoor environments due to the signal attenuation and multipath effects, although it as the major positioning devices have a powerful accuracy for outdoor positioning. This research investigates other built-in GPS and develops methods for improving the accuracy of indoor positioning. Combination with the wireless network, it can be a viable alternative solution for the indoor positioning purposes of the smartphone users. The main advantage of this solution is that it can be deployed with a minimal cost, as no specialized hardware is necessary for setting up the system. However, challenges remain for this solution due to complex indoor environment involved and extensive calibration data overhead.

KEYWORDS: Inertial Measurement Units (IMUs), WiFi, Received Signal Strength Indicator (RSSI), Particle Filter, Indoor Localization.

I.INTRODUCTION

A. Overview

Now a days most of the people using the smartphones for our daily purpose. Because the android smartphones have the memory capacities, good processing speed and higher data transfer rate. Android is Linux based operating system with java support and it comes with open source software.

Many map based android application is available in the Google play store. Map is used to transit the users from one place to another Google map, GPS is used for finding the specific location in outdoor environment. Using this application people can easily find the location such as roads, bridges, airport, shopping malls, etc. GPS (Global Positioning System) is one of the popular navigation system in the world. But it gives higher accuracy for outdoor environment not for indoor environment. Many university campus, shopping malls and organisation are very large, so the people are difficult to find the location inside the shopping malls, university campus and organization. There is no effective features for finding the location inside the buildings. In the application, using the indoor location based services is used to find the current location of the mobile clients. Indoor Location Based Services is the extension of location based services. It is used for tracking the location inside the buildings or campus. Indoor Atlas android SDK is used for indoor navigation. The SDK offers the features like the indoor positioning with higher accuracy and obtaining floor level. In Indoor Atlas to track the desired location then update the floor details for desired location and after fixing the route inside the buildings.

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B. Background

Whenever a user visits a new site (place) which has a large perimeter a proper guidance system is needed. When the user is outdoors technology like GPS can easily be utilized but when inside a premises like a hospital, college, mall etc., it doesn't work so it is very difficult for the user to navigate through the place and reach their destination. Various technologies have been used over time for the purpose of navigation like RFID, sensors, Bluetooth, WIFI etc.; while on one hand technologies like RFIDs and external sensors need to be carried around by the user all the time. There is also the issue of cost effectiveness in such devices and on the other hand devices like Bluetooth which is already available in smartphones cannot be used because of their short range. So the most efficient way for navigation is through a WIFI in such conditions. This system works on the same principle where WIFI technology is being utilized to help user to navigate in an indoor environment. Here already available WIFI in the user's smartphone and those inside the different outlets (in case of shopping malls) or departments (in case of college and hospital) are used for the purpose of navigation and tracking on site. Here already made available map (by administrator) are downloaded from the server to user's smartphone. Then this map is plotted with various locations of outlets and then this map is saved to the users' mobile unit. WIFI routers are used to localize (to find the exact position of the user) user through a concept called triangulation method (it requires signals from three or more Wi-Fi routers). Signal strength is an important factor for finding the exact and accurate location of smartphone user because if the strength is weak of even one of the routers then the position would be wrong by some meters. Though it is not a big issue in outdoor environment it is problematic in indoor environment as the user will be standing outside an outlet and the application will show another one. This is highly inefficient and the application won't be of much use. So we need three routers with good signal strength.

II. LITERATURE SURVEY

In this paper propose a Euclidean distance correction algorithm, then use it in Bluetooth positioning. Such solution can be used in the real situation, with the advantages of low cost and high durability. [1]

In this paper design WaP (WiFi-Assisted Particle filter), an indoor localization and tracking system exploiting particle filters to combine dead reckoning, RSS-based analyzing and knowledge of floor plan together. All the prerequisites of WaP are the floor plan and the coarse locations on which room the APs reside [2].

In this paper introduce with a new tracking system which is an innovative additional device that can enable the individual to enjoy the flexibility in motion and develops an advanced sense of confidence and self-reliance [3].

In this paper, we build an Android application which achieved the aim of seamless positioning between the inside and the outside. The system contains four parts: outdoor positioning, which uses GPS and Baidu Map, indoor positioning, which adopts Wi-Fi fingerprint positioning, contextual detection, including indoor and outdoor detection and floor detection, which takes advantage of multiple sensors integrated on Android, functional configuration, whose work is to establish and manage Wi-Fi fingerprint database [4].

In this paper we present RADAR, a radio-frequency (RF)-based system for locating and tracking users inside buildings. RADAR operates by recording and processing signal strength information at multiple base stations positioned to provide overlapping coverage in the area of interest [5].

This paper pertains to the reduction of the effects of measurement errors in rate gyros used for tracking, recording, or monitoring the position of persons walking indoors [6].

In this paper introduce a methodology for indoor localization using a commercial smart-phone combining dead reckoning and Wifi signal strength fingerprinting. Additionally, we outline an automated procedure for collecting Wifi calibration data that uses a robot equipped with a laser rangefinder and fiber optic gyroscope [7].

In this paper, we propose a novel model of stride length estimation for pedestrian dead reckoning (PDR) that allows a PDR system to switch its estimation method according to whether the pedestrian is walking or running [8].

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In this work, used to fuse the CSI-based ranges and velocity estimated from inertial sensors by an enhanced particle filter to achieve highly accurate tracking. The algorithms are designed in a network-based system, which uses rather cheap commercial devices as anchor nodes. We evaluate our system in a complex environment along three different moving paths[9].

In this paper, compare two time-based localization algorithms for narrow-band signals, i.e., multilateration and fingerprinting. First, develop a new Linear Least Square (LLS) algorithm for Differential Time Difference Of Arrival (DTDOA). Second, fingerprinting is among the most successful approaches used for indoor localization and typically relies on the collection of measurements on signal strength over the area of interest[10].

III. SUMMERY AND COLCLUSION

In this work we introduced the primary technologies used in indoor localization systems. Both commercialized products and research prototypes are discussed. System for pedestrians is proposed in this system. The system integrates a traditional PDR system with SRP adaptive drift calibration at access control points and a particle filter map matching algorithm. The information derived from SRP subsystem enables PDR to offer drift-free tracking and by taking advantage of existing access control systems, it offers a natural way to integrate user interactions at no additional cost. The map constraints, introduced by a simplified particle filter with LTR mechanism, further enhance the accuracy and keep the computation complexity acceptable for real-time processing on mobile devices with limited resources. The long-term experiment verified the robust and reliable tracking of the proposed system with 0.13% final position error with respect to a total travelled distance of over one kilometer. Moreover, the accurate tracking performance is independent of travelled distance and the system covers both corridor and rooms of indoor environments, offering a more practical way for pedestrian navigation.

Future work will focus on extending the system to support different ways of carrying the smartphone during walking. Also, a more comprehensive system will be studied combining both outdoor and indoor environments to provide seamless tracking of the pedestrians.

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