

An Intelligent Navigation System for Indoor And Outdoor University Campus On Smart Phones

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ABSTRACT

An University campus may be very large and every year new students get admitted in the university. Yearly new buldings may get constructed, offices may get shifted, so it is very difficult for the new user to search each and every place within the time limitation, Sometimes new comers or parents may just come to visit the campus that time also it is difficult to visit all places in campus and also to find the current location of the user. The new faculty members, students and employees may face the same problem inside the campus. There is no efficient system which will provide information about events which will happen in few. hours. The university campus navigation system provides user with proper destinated location and shortest path from current location to the destinated location. In this paper we have discussed about indoor and outdoor navigation techniques which can used on smartphones.

Index Terms : Navigation System, Pedestrian Dead Reckoning, LBS, GPS, Augumented Reality, Google Maps

I. INTRODUCTION

The recent advances in development of mobile devices has gained the popularity and progress with respect to the memory capacities, higher data rates and some of the performance parameters. Nowadays, android phones have becomes most popular in mobile market because android operating system is an open source. Location base service(LBS) provides personilized services to the android mobile user according to their current location. Geographical Information System(GIS) is heart of the LBS which provides all the features of LBS.

User can track their location and also navigate from one loaction to another very easily. There are many technologies to track the location like cell identification, WiFi Identification System, GPS, Augumented reality, dead reckoning, RFID tags, QR codes. GPS technology gives higher accuracy than other system but GPS only works for outdoor navigation system where augumented reality gives higher accuracy in indoor navigation system. For indoor navigation also others techniques can be used like dead reckoning, accelerometer and QR codes. This indoor navigation applictions can be used with GPS unabled smart phones. The interest of indoor loaction-based navigation has many challenges in utilizing the mobile device's sensors more efficiently and effectively to compensate the inability of GPS to work in indoor navigation[2]. This all techniques

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can work with smart phones which will use different mobile networks like Global System for Mobile communication(GSM)[1]. There are many applications and commercial devices that provides driving directions,google navigation[google maps], in campus navigation [smart GPS] This navigations becomes easy with GPS enabled android devices. The location tracking techniques can work with different kinds of networks such as GSM (Global System for Mobile communication) GPRS (General Radio packet Service) and CDMA (Code Division Multiple Access). This System provides the indoor and outdoor navigation for the user which is user friendly. For the indoor navigation the application seeks to a model 3D map of university campus by referencing a floor plan of campus.

II. OBJECTIVE

The objective is to design and implement the user friendly indoor and outdoor navigation that provides directions to users destination and also the events which are taking place in campus with its location.

III. MOTIVATION

A University campus is complex infrastructure. Specially new students and people who are new on it for the first time are hard to be oriented themselves and find the places with the shortest path from their current location. Whereas it is common to use the navigation system to reach destinated locations.

IV. GOAL

A mobile devices like smart phone has become more powerful and affordable for majority of the people, they are starting to access all different parts of their life. The use of smartphones come along with real time mobile application which is becoming more common, especially in the university domain.

The goal of this is to create a application prototype for smartphones, which supports people on university and also the students, visitors. Just like car navigation system, the navigation system for university should be developed. Paths calculated for car navigation systems are two dimensional, paths on campus consist of different segments on different building floors so in most cases, its three dimensional. Considering this, the 3D navigation system has to be designed.

In addition to the navigation feature the user should know its current loaction which is used to show him near by points of interest also the events locations in in university which the user is interested. To make the application intersection and fun to use also we can add the features like posting the comments and friend location which can be displayed using augumented reality.

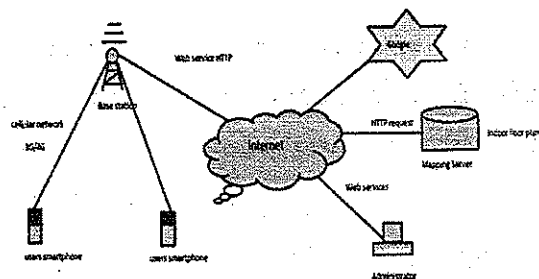


Figure 1 Architecture

Figure 1 shows the architecture of indoor and outdoor campus navigation system, the smartphones of android or windows operating system which is used by the user to use this navigation system. Users mobile phone should have this campus navigation mobile application installed in it. The mobile phone has to be connected to its respective network service provider called as data pack of 3G/4G then through base station the user will request for the service at the server side there is one mapping server which has database of campus indoor and outdoor map this is called as mapping server. Mapping server uses the google map to navigate the paths. The administrator will be updating the paths, modified or changed path, buildings, hostel, canteen, library etc etc. Even he will keep track on the events with its location, the daily updated information the admin will be updated on the map also using the internet. GPS should be enabled in users mobile to track the location.

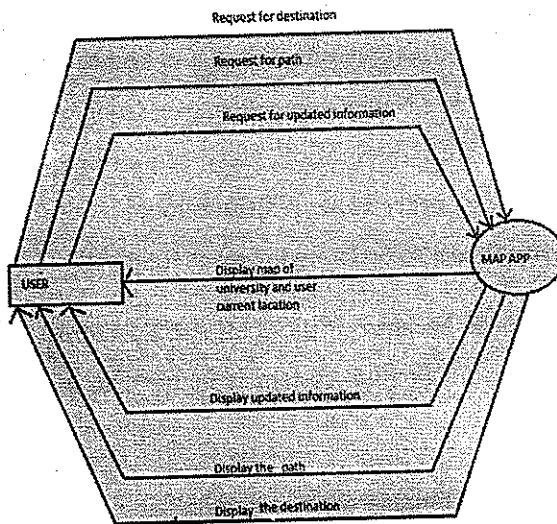


Figure 2 DFD Application

This flow of data shows how the request and response of the users is designed on data flow diagram. When user request for the specific destination it displays with destination, when user request for the update information such as any events in university and all it shows the events with its location. If user request for the changed map then it shows the changed map of university also user can request for specific path so its request and response data flow in an application.

V. COMPARISON BETWEEN THE PROPOSED NAVIGATION SYSTEM AND GOOGLE MAPS

Google maps are used for plotting the places and also allow you to show your location and then follow as you move without having to tell to navigate to any one place, also google maps show only users surrounding area (Sky View) and current location of user. Where as Navigation is very user friendly it to use as it is used to navigate to specific destination. It is also used to show the turn by turn directions

according to users need. Navigation is better for unknown destinations there are some of the advantages of Navigation system over Google maps such as Full integration, easy searching, quick rerouting, street view, realtime update, adds on feature and also updating the maps frequently.

So, hence because of these all extra features the proposed navigation system is better than google maps.

VI. METHODOLOGY

In this application mainly we are considering the two navigation systems that indoor navigation system and outdoor navigation system.

A. Indoor Navigation system

Indoor positioning system is always been interesting navigation system due to its inability in the accuracy as compared to the outdoor navigation system such as GPS. Following are the various technologies which are used in the indoor positioning system.

B. Pedestrian Dead reckoning

This is the method where it is used to calculate the current position by using previous determined position. PDR is technique that utilizes the accelerometer sensor to track the user pattern of step and with this the patterns can be used to count the users step. Accelerometer sensor is one of the most used sensor, this is dynamic sensors which is capable of sensing the accelerometers are available and can measure acceleration in one, two or three orthogonal axes. These sensors are available in today's smartphones.

C. Augmented Reality

To create the interactive application this augmented reality and dead reckoning methods are used. Augmented reality is used to provide low cost interactive navigation system this application act as virtual guide that displays the campus floor plan and layout via augmented reality. AR refers to the technology which generates the sensory information which are overlaid onto mobile camera, this information will be used to help users to understand their environment better with real information of their actual surroundings.

The AR concept is to overlay an interactive virtual 3D map of indoor floor plan of the campus environment together with navigation path to guide the users to their specific destination. The 3D map is then overlaid on live feed from the onboard camera. To identify the current location in 3D map some image recognition techniques are applied. Then the application will continue to track the users movement through the PDR system.

D. WiFi Identification System

Visitors of campus can take 3D device which has dual screen and WiFi capability acts as virtual personal navigator 3D device is able to sense the location of the user through this WiFi identification system and display the information. Some of the inbuilt sensors will be available in smartphones those sensors will be used in this system. For this user needs to use the AR which will show the live feed through users camera. In this techniques the user need not to go to options and clicking the buttons just user need to open the mobile phone's camera towards their

surroundings to identify their location and other points.

E. RFID (Radio Frequency Identification) Tags

RFID is a wireless radio based information exchange technology that is mainly used to identify and track physical object. To compute a user's location distance between the tracking tags of the known location called as landmarks is calculated and approximated positioning information of the user. Advantage of this system is the cost of the system can be greatly reduced, but the radio signals multiple effects which could affect accuracy of the system.

F. QR code

Quick response code is a type of two dimensional matrix barcode which has information encoded on to QR code it includes information like URL, texts, SMS, contacts. Most mobile phones these days have incorporated the capability for the inbuilt camera to act as QR code reader that will interpret the information stored in it. QR codes provides an effective way to deliver the required positional information. In this application the QR codes functions as location marker to determine the location of the user where PDR system is used to track the movement of the user.

VII. OUTDOOR NAVIGATION SYSTEM

Campus Navigation System and updated event information in this navigation system will display on the user's mobile. When user entered the campus that time user's mobile WiFi or data should be enabled. This application shows the locations (landmarks) of

university, whenever user wants to go to that specific destination then give the input as destination location this application will navigate the location and shows the destination and shortest path from user to destination, so user can reach as early as possible without wasting the time.

This application will also display the events which are happening daily in the university for example the events in university are workshops, conferences, meeting, development programs, cultural events etc so this application display the event with its time and the location so user can not miss the events in which they are participated.

VIII. CONCLUSION

The System Environment is designed to create the mobile application which will help the user to find the locations, events with its locations and current location of user in the university.

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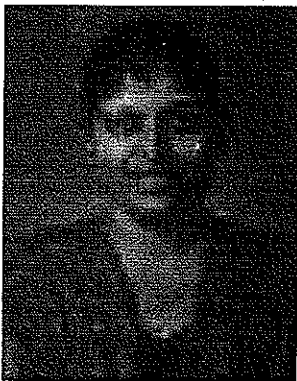
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