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RESEARCH ARTICLE

VEHICLE LOCATOR WITH BLIND ASSISTANCE

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ABSTRACT

This is a novel solution for tracking the location of a vehicle and availability of seats in real time (for public transport vehicles) using mobile application which also has a blind assist mode that helps blind people to use the app by voice commands. Two modes of operation are normal mode and blind assist mode which can be launched either by clicking on app icon or by shaking the device when it is in blind mode. The system tracks the location of the vehicle using a GPS and the longitude and latitude addresses are fetched and stored in a web server through a Wi-Fi module from the controller. The seat availability is determined from the output of two IR transmitter-receiver pairs which identifies whether a person is entering or exiting from the vehicle. These obtained information are made available at the user end through a mobile application which runs on android platform. The system is built on Arduino and ESP8266 is used to connect to the remote server. This system can not only be used to track public transport vehicles but can also be made use to find lost vehicles also.

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INTRODUCTION

The public transportation system is used by majority of the population. When we depend on public transportation system we must plan our journey according to the timing of the vehicle. The reason why people choose private vehicles over public transport system is that it they do not know the timing of the vehicles. The real-time monitoring of the position of the vehicle becomes necessary in such cases. The real-time vehicle data, which comes from the vehicle tracking system, helps us to know the current position of the vehicle and thus estimate the time of arrival of the vehicle. Our system aims at making the public transport system more efficient by making the location of the required bus available to the user. For this each vehicle is to be provided with unique number and is to be equipped with GPS, Wi-Fi-shield and a router. The system operates in two different modes, a normal mode and a blind assist mode. GPS tracks the current position of the vehicle (Pham Hoang Oat *et al.,* 2013). The Arduino Uno board with ATmega328 microcontroller access the information from the GPS modem. The Arduino Uno is used for making the communication between ESP chip and GPS possible. The ESP chip updates the latitude and longitude information into the local server, that is, the WAMP server. In the normal mode, at the user's side an android application is provided to access the location of the required vehicle.

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The user has to give the unique identification number of the vehicle in the app and the search results provide the information about current location of the vehicle and also the provided Google map link directs to the Google map showing the location. For the people who do not know the vehicle id, another option showing all the vehicle id and routes are also incorporated in the app. In the blind assist mode, the carrier app will be enabled when mobile is shaken and a voice search option will be opened. In this voice search option, a 'From'-'To' details has to be given and now the user can search for the vehicle location by tapping the phone once.

Global Positioning System (GPS)

GPS is a navigation system which works on the basis of satellite signals. GPS satellites rotate around the earth and transmit signals to the earth. The GPS receivers on earth receive these signals and the position is identified using Triangulation method. Using triangulation method position of the receiver can be found in 2 dimensions or in 3 dimensions. In order to find the location in 2 dimensions 3 satellites are required and for find the location in 3 dimensions 4 satellites are required. In this system, we need only latitude and longitude values.

ESP8266

ESP8266 is a microcontroller chip. It is with integrated TCP/IP protocol stack. This integrated stack helps a microcontroller to access any Wi-Fi network. The ESP8266 is capable of hosting

an application or transfer all Wi-Fi networking functions from another application processor. Each This module has pre-programmed AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers.

Android Application

An Android application is a software application that runs on the Android platform. As the Android platform is built mainly for mobile devices, a typical Android app is designed for a Smartphone or a tablet PC running on the Android OS. Android apps are written in Java programming using Java core libraries. The Android application helps user to access the information required from the server (Amol Dhumal *et al.,* 2015).

Existing systems

The available data about the public transport timing is based on the previous analysis of the timing. It does not track the vehicle on real-time basis. Therefore, the public transport system user cannot access current position of the vehicle. There may situations like traffic congestion. In such cases the estimated position of the vehicle may vary. This causes difficulties to the user. Such situations can be avoided by real-time monitoring of the vehicle. GPRS system providing the same functionality is available. But the system is costly. Also, the system sometimes goes to the standby mode. Therefore, we cannot assure whether the server is updated properly. Also the blind assist feature is not embedded in such systems.

Proposed system

In this proposed system, the current position of the system is updated in intervals of time and is made available to the user whenever asked. The GPS modem gives the latitude and longitude of the vehicle, with a unique identification number, which is then passed to the Arduino board with ATmega328 microcontroller. The data in the microcontroller is then given to the Wi-Fi shield which gives connectivity to the server. The server gets updated with the data from various vehicles included in the system. The Android application is used by the user to get the position of the desired vehicle.

Fig. 1. Android app

When a valid vehicle number is entered, the app directs the user to the Google maps in which the current position of the vehicle will be displayed (Marufi Rahman *et al.,* 2016).

Fig. 2. Android app along with vehicle ID

When the unique identification number is given the application will give the resulting position in the Google map.

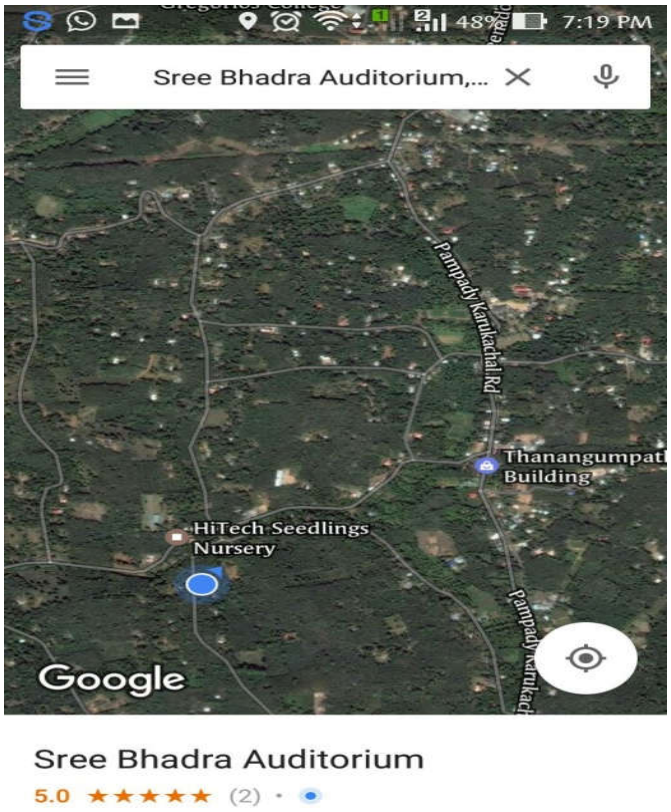

Fig. 3. Resulting Google map

There are two IR transmitter-receiver modules placed near the door of the bus. One transmitter-receiver module is placed just after the other one. When a person enters the bus, the count gets incremented. When a person leaves the bus, the count get decremented. The updated count will be subtracted from the actual number of seats in the bus and if any seats available the number will be shown and if not the status will be shown as 'No seats available'.

Working

When the vehicle is started, the GPS as well as the arduino is switched on and thus the tracking takes place. Through the Wi-Fi module the data collected is passed to the server. Thus, the current position is updated in the server continuously. The ESP

chip can work even without Arduino. But here, in this system, Arduino is used as an interface between the GPS and the ESP chip.

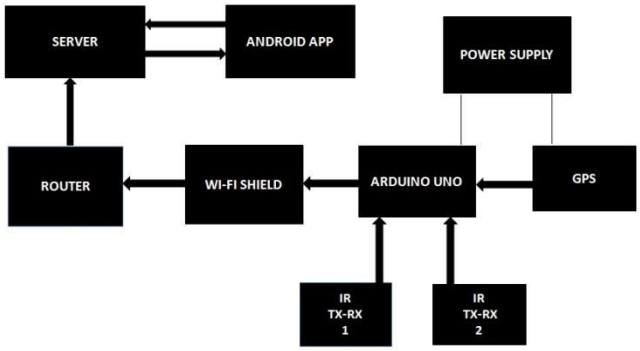

Fig. 4. Block diagram

The WAMP server is programmed using PHP programming. The functionality of the server is programmed inside the Apache server in the WAMP. The WAMP server can use the entire space available in the system in which the server is installed. The data in the server is in the form of a table in which vehicle number, latitude and longitude are updated periodically without fail. Failure occurs only if there occur any connectivity problem with the Wi-Fi. The Wi-Fi module and the server communicate by calling a Hypertext preprocessor (PHP) file which contains instructions to collect data from the ESP chip. The data is thus passed to server through a router. The communication between android app and the server also occurs by calling a PHP file. When a valid vehicle number is entered into the app, the PHP file calls the data belonging to the corresponding vehicle number. Another PHP file gives data to the app and Google map is accessed. The seat availability will be shown with the help of two sets of transmitter-receiver modules. These IR transmitter-receiver modules are placed one after the other in the door side of the bus. When a person enters the bus, the first module detects the person first and then the second one. This will get counted as the person entering the bus and the count gets incremented. When a person leaves the bus, the second module detects the person first and then the first module. This decrements the count. This count will be then subtracted from the actual number of seats in the bus and if any seats available, the number will be shown and if not the status will be shown as 'No seats available'. The main advantage of this system is that it can be accommodated in any vehicle without any modifications.

Conclusion

This system makes tracking and checking seat availability easy in real time and since it is a small and low cost system, it can be attached to any public/private motor vehicles without much alterations on them. It is flexible, can be used by anyone without much learning effort and is helpful for those who are visually-impaired.

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