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Real Time Bus Location and Monitoring System Using WSN/IOT

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ABSTRACT

This journal present Real time bus location using WSN and Internet of things. Bus user appealed to get bus arrival at the right time, but until now the shuttle bus service in most countries only provide a timetable and most of the time it is unreliable. In this project, the system is designed to provide real-time location, latest bus stop checkpoint and the estimated arrival time for the bus. A web page system is designed with an interactive interface as a platform to access all the information required by the user. Hardware and software have been used to achieve the objective of this system. For hardware part that used in this system is Arduino Uno R3 is used as a central processing unit for managing all the input and output. The system was able to bring convenience in time planning while waiting for bus and improved bus users travelling experience. The mobile application is also another feature. It's offer a very useful feature like the movement of the bus in real time the time that the user take to arrive to the bus as well as the distance between user and bus stop point

Key words: Real Time Bus Location and Monitoring System Using WSN/IOT

INTRODUCTION

Transportation becomes very difficult nowadays specially in the cities which contain a very huge population like Kuala lampur, Beijing, Shanghai, Mumbai and London. The public transports, especially buses are developing around the world. Such public transports in order to reduce the usage of private vehicles thus reducing fuel consumption and mollifying traffic congestion. The problem with buses is that the commuters do not know the exact timing of arrival of buses at their stops. This leads to waiting for buses for approximately 30-35 minutes as the commuters are not aware at what time exactly the bus will arrive [1]. Most of today's vehicle tracking system uses Global Positioning System (GPS) to get an accurate reading of the vehicle position. Communication components such as cellular (GSM) and satellite transmitter will be combined to transmit the vehicle's position to remote user [2]. This system has also proof its ability to reduce mileage hence, reduce the fuel costs through monitoring private use of vehicles. Reducing the average speed of the vehicles also improve the fuel efficiency. Productivity also will be increased through better budgeting of time and resources [3].

PROBLEMS OF THE BUS

The public transportation system has a direct impact on the economic development of the country. Planning, tracking and monitoring public bus schedules is one of the major issues of all public transit sectors. Passengers want the bus to know the exact time of arrival. People tend to increase their personal time. Rather than go to work early to wait for the bus, they usually come from the stairway leading from the bus stop. Despite the bus, the schedule can be freely available online or by using a mobile phone application, and bus operators often do not follow other factors. For example, intervals such as downtime, traffic conditions, and collapse. These factors have proven that schedules provide limited information to users. As a result, bus users became frustrated when they missed the bus and delayed their daily schedules. In addition, in the case of harsh weather conditions, long wait times, hot sun, rain, and foggy weather can have unpleasant atmospheres for bus users. Very long waiting times at the bus stop cause anxiety among travellers and

make them reluctant to take a bus. At the end of the day, we decided to rely on transportation to get to the destination, so traffic flow on the roads increased.

Real Time Location

In order to get the real location The Google Maps Geolocation API returns a location and accuracy radius based on internet connection. The active GPS antenna operating at 1575.42MHz frequency is used in receiving the satellite GPS signal and feed into Sierra Wireless. By using the Global Navigation Satellite System where have receiver inside the module, the Global Positioning System data can be extracted to locate the real time position of the bus. The C++ program is used to extract the raw GPS data. There have four values each for the latitude and longitude is extracted, which is the value of degrees, minutes, seconds and cardinal direction is extracted and output into total of 8 separate text files. Latitude and longitude given in minutes and second so that the result is more precise. For examples the value of latitude is 1 degree, 52 minutes, 2.89 second, and North for cardinal direction. For longitude value is 103 degrees, 7 minutes, 13.15 second and East for cardinal direction [4].

DESIGN, MATERIAL, PROCEDURE, TECHNIQUE OR METHODS

The monitoring unit consists of a SIM900A shield and a Web Application. The GPS will acquire the position of the bus (longitude and longitude) and then by posting those coordinates in web application user can get the exact location of the bus [5-6]. By using the intermediate design, the user can send co-ordinates from GPS module computer directly to the tracking system. The computer will automatically copy (rather than typing or inputting) the longitude and latitude to the designed web page to view the vehicle's location on Google maps. With the help of these modules we can locate the location of the vehicle.

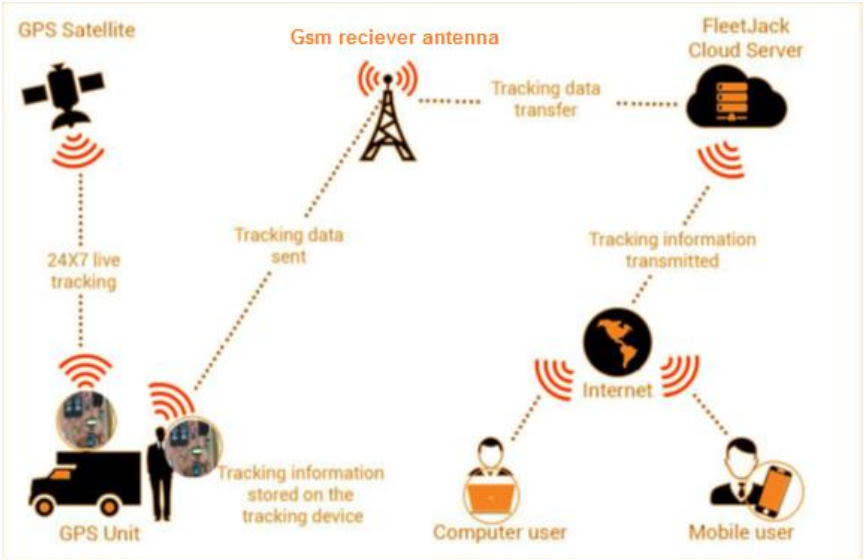

Fig. 1 System Architecture

GPS Tracker Design

The following figure illustrates the different components constituting the GPS Tracker. In the first figure the GPS Tracker is composed of a Telephonica GSM/GPRS shield that will be used to send HTTP requests to the WEB server, a GPS shield used to receive current GPS data from GPS satellites and Arduino UNO in which all data will be processed.

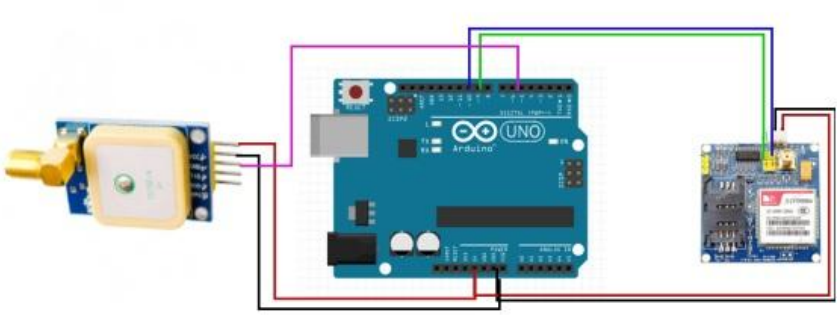

Fig. 2 GPS tracker Design

RESULTS AND DISCUSSION

After the design phase, GPS Tracker must be implemented. GPS Tracker which is composed of GSM/GPRS shield that will be used to send HTTP requests to the WEB server, an Itead GPS shield used to receive current GPS data from GPS satellites GSM/GPRS shield that will be used to send HTTP requests to the WEB server, an Itead GPS shield used to receive current GPS data from GPS satellites After implementing the circuit above and testing the connectivity of the GSM/GPRS Module with different SIM Cards from different providers, It was able to use the GPRS network to send HTTP Requests to the remote server. The following pictures show the final implemented circuit which represents our GPS tracker.

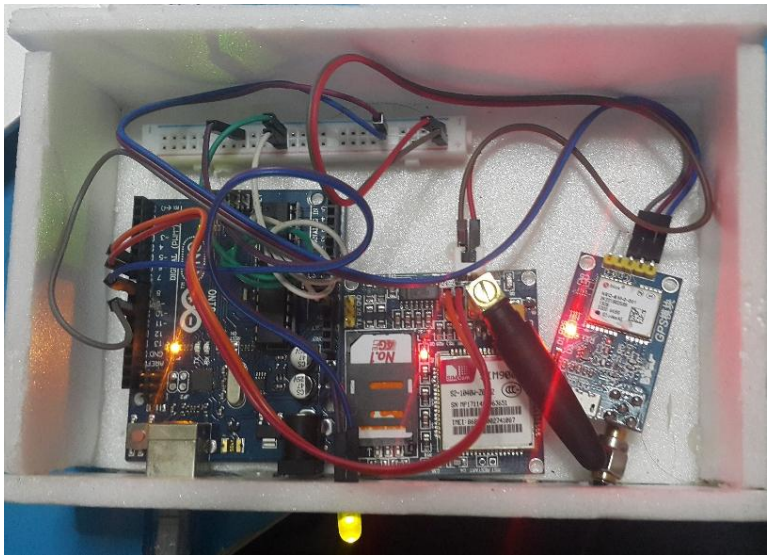

Fig. 3 Main system Design

In the early stages of the project, it was capable to find the current location of the device then it's developed by adding the feature of web site like adding the bus driver name and the distance between user and the bus. all these data are uploaded to a virtual server designed using high level programing language like PHP Laravel and many others like HTML, Java and Java script, MySQL is used to build a data base in order to store data of the real time location while the prototype and web site give the required result, then a mobile application was a raised it was designed using Android Studio which is a good tool for designing android applications. Mobile application was very useful for users because it allows the user to know the current bus location as well as the distance between user location and the bus. Application was easy to dealing with it. Just install the mobile application open it simply it works correctly. another feature was added is by linked this application with Google map so now the user will be capable to now the directions to the bus and the time taken to arrive to the bus as well as the shortest path to arrive to the bus most of these features come from Google map features all these make user comfortable to use the service of the bus in the palm of his hand.

The figure 4 shown below represent the first page of the web application which consists of two parts the first one is the user name, while the other one is about password for security reasons this web page designed using PHP Laravel.

Login Page:

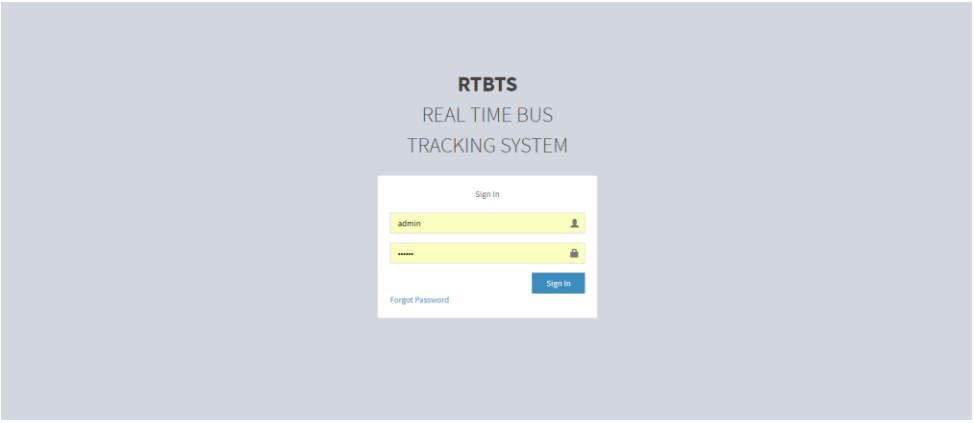

Fig. Error! No text of specified style in document. Login Page

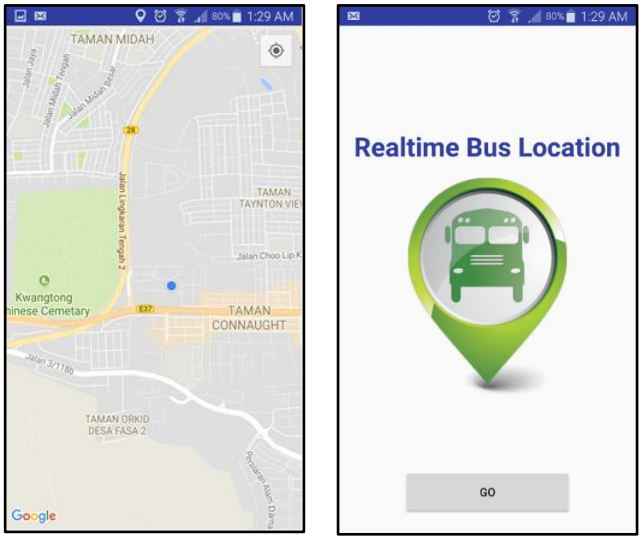

Fig. 5 Dashboard Page

The figure 5 shown below represent the dashboard page which consist of two parts the first one is bus icon which is all about the name of the driver and the plate number for this bus as well as the location of bus in real time. The other one is about adding user such as user admin, page manager and other. This one is contain user Email, Mobile no. and many other details must fill in by the user as shown in figure below

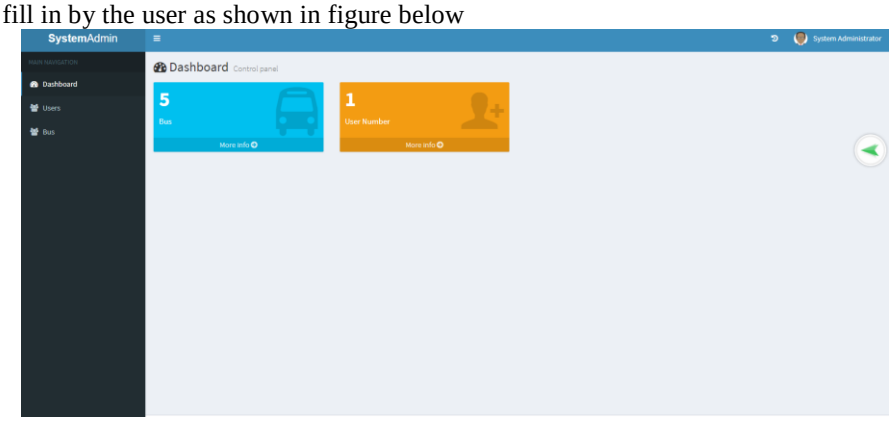

Fig. 6 Real testing using Android App

The figure 6 which mentioned below is about the real testing of the project. The first picture represents the movement of the bus while the second one represent that the bus location in a different city while the user at another city. The third picture of figure 7 represents the testing phase at Universiti Tun Hussein Onn UTHM, shows the movement of the bus at university facilities and institution.

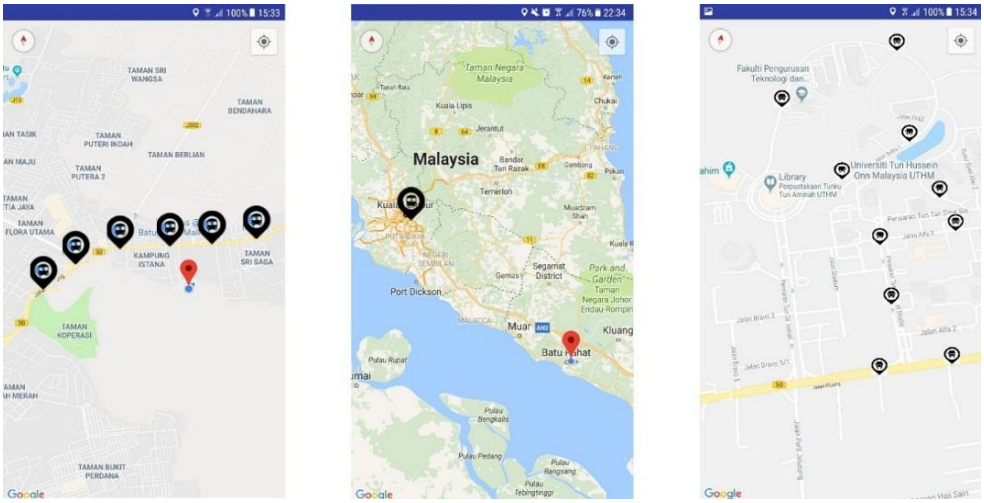

Fig. 7 Real testing in various locations

CONCLUSION

Designing and Implementing a completely working GPS tracker was the first challenge by using Arduino Uno as a main central processing unit then connect the first part which is GPS sensor Neo-m6-0-001 to get the real-time location of the bus. The first programming code was proved that this system capable to give the desired result, then this system used a SIM900A to receive the data that come from the Arduino and transmit these data to the cloud server.

After finishing the first challenge the second one was about designing a web page capable to provide the desired information to the user. By design a web page using PHP laravel high-level language the code consists of many programming languages such as Hypertext Markup language HTML, Cascading style sheet CSS as well as java and JavaScript. The data of longitude and latitude can get from a virtual web server store database designed using MySQL.

The third part was about designing a mobile application that is capable to make the use of bus services very easy and comfortable especially for the user. For this reason, android studio software was used to design the main feature of this app as well as connect this app to Google maps API V2 features. Finally, this project has been proved its efficiency because it provides good service for the users in spite it has some delay of time-related to the cheap GPS as well as the transmitting data operations. Of course, the GPS can be exchanged with expensive one to get the accurate signal up to one meter and to have high-performance services.

Acknowledgements

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