



College Bus Surveillance through IoT

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Abstract: The aim of the project is to develop a system to monitor pick-up/drop-off of students to enhance the safety of students during the daily transportation from and to the college. Tracking System involves the installation of an electronic device in a bus, with an installed IoT to enable the Administrator/User to track the bus location. Based on IoT this project is implemented as embedded application. There are two applications one for server and the other for the client (students). Buses carry GPS devices to track their positions. Students would receive the message about the position of the bus. The server will monitor location and will store its data in the database. The students/staffs can get flexibility of planning travel using this application, to decide when to catch the bus.

Keywords: IoT, ATMEGA microcontroller, GSM Modem, GPS Receiver, LCD

I. INTRODUCTION

Effective transportation system has effective movement of goods and people which leads to better quality of life and better social and economic growth of the society. Transportation system forms the heart of the system. With the population boom vehicle population is also rapidly increasing which is further leading to heavy traffic. Optimal solution to this problem is the use of public transport. However public transport schedules are unreliable and waiting for bus for long results is waste of time. But a system that provides complete information namely the routes through which the bus goes, maps that guides the passengers and most importantly tracking the real time bus location coordinates and finding correct time the bus will take to reach its bus stop. But, however the bus service is not reliable. To come over these day to day problems Bus Tracking System has been set up on the major route of the city. This system uses the Android platform with the built in GPS receiver in the smart phone.

The main objective of this project is to providing real time information about the location and estimated time of arrival of the buses. This project focuses on the implementation of a real time bus tracking system using GPS and internet service. Therefore this solves the problem of unusual and unexpected condition which affects the smooth operation of the bus system and the movement of

vehicles. This project uses a variety of technologies to track the location of buses in real time.

Sunil et al proposed an IEEE paper titled as Dynamic Bus time table using GPS but it has a limitation that it does not predict the accurate location of the map. The author Karan published a paper titled as Bus tracking using GPS and it is not completed and not scalable. Dr. George has published a paper titled as Real time location of the bus via SMS using android and it has disadvantages such as tedious procedure is involved and the server is overburdened. The author Manikandan published a paper named as Public transport service monitoring using Zigbee and RFID but it has a more complex procedure. The author Kumar proposed a paper titled as Bus Surveillance based on GSM and Zigbee and it has a disadvantages of having several number of hardware devices.

In this paper the section II deals with the proposed system model and its implementation and section III deals with the results and discussion and section IV deals the output obtained from this project and discussed the future enhancement and the last section listed the numerous references related to this project.

II. SYSTEM IMPLEMENTATION

A. Methodology

This project mainly consists of ATMEGA 328p is a microcontroller used to program with GSM. Based on IOT the students/staffs can access this information of a bus based on user's source and destination through the internet. Our



proposed system gives the exact real time location of the bus. Smart bus tracking technology is advantageous for tracking and monitoring the college bus.

B. System Overview

Our system provides the relevant information regarding all the bus route details going from the user source & destination along with the bus stop arrivals through alert messages and real time location. Generally our system is operated by GPS which is attached with the bus. Firstly GPS receives the satellite signals then the position coordinates with latitude and longitude are determined by it. The location is determined with the help of GPS and transmission mechanism. After receiving the data, the tracking data can be transmitted using any wireless communication systems.

GPS sends the signal to controller through interfacing unit. In interfacing unit here we use MAX 232. Controller receive the GPS signal and to update the information in webpage through IoT via GSM modem. GSM is also interfaced with controller through MAX 232 which is used to convert TTL signal to RS232 signal. It is used for serial communication between controller and communication devices. If the bus is start to run in one location, then GPS track the location and GSM is used to send the message to students about the bus location. This IoT technology makes the students/staffs get flexible of planning travel through this project application and to decide when to catch the bus. Here LCD is used to display the current status of the project information.

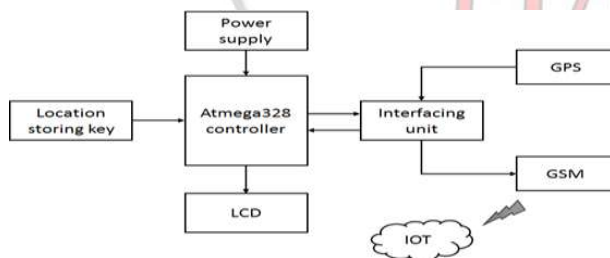


Fig 2.1 Block diagram for Bus Monitoring system through IoT

The above figure shows the system block diagram for the bus tracking project through IoT. This block diagram consists of ATMEGA controller, power supply, location storing key, GSM, GPS and LCD. Power supply is sued to convert AC to constant DC voltage. It is given to all units. In this project we use Atmega328 controller. It consists of 28 pins, the inputs can be controlled by transmitting and

receiving the inputs to the external device. It also consists of pulse width modulation (PWM). In this system to track the college bus through IOT. Location is stored in the controller by using key. GPS is used to track the location of the bus.

C. GSM Technology

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. GSM modems can be a quick and efficient way to get started with SMS, because a special subscription to an SMS service provider is not required. In most parts of the world, GSM modems are a cost effective solution for receiving SMS messages, because the sender is paying for the message delivery. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. It exposes an interface that allows applications such as SMS to send and receive messages over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. The location of the bus is tracked using GPS and sends the collected data to a remotely located server using GSM module. Using this application, students or staffs can locate the bus at any time when they need. The collected data is retrieved and processed by the server and that provides the students and staffs convenient for travel from long distances.

D. Usage of GPS and IoT Technology

The Global Positioning System (GPS) is a space-based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver. In our project we develop an application on smart phones to monitor a location and timing of the college bus using IoT. It works using GPS and GSM technology designed to continuously monitor a moving buses for doing so a microcontroller is interfaced serially to a GSM Modem and GPS receiver used to send the position.

IoT shows where buses are on a map and provide students and staffs the updated information at different time interval using GPS. The server will monitor location and will store its data in the database. The students/staffs can get flexibility of planning travel using this application, to decide



when to catch the bus. Atmega328 microcontroller is used to programming for software and hardware module. And it is connected to the cloud and following through the GSM modem. The waiting time of the user can be reduced. Simple mode of communication is the key feature of the Bus Tracking system. This application can be easily extended for central tracking system to keep track of all the buses.

The different queries and efficient route management can be effectively done through central server system. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

III. RESULTS AND DISCUSSION

By this project we can find the real time location of the bus with the use of GPS and GSM technology. Also it can able to send the details of the current bus location needed for the particular person via SMS. This project generates the prediction of bus arrivals at stop along the route. The application of this system implementation at a specific pickup point will send the current location of the bus to students when they request.

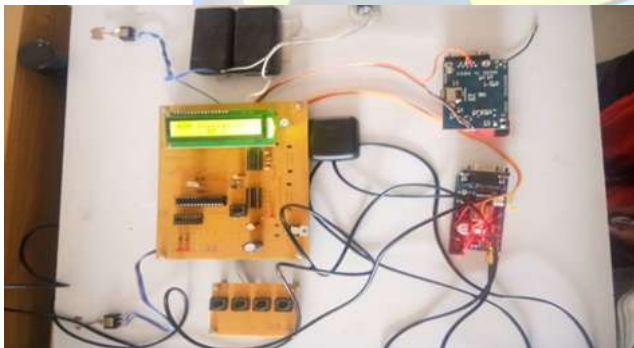


Fig 4.1 Hardware Model

The above figure 4.1 shows the hardware model of the bus tracking project to monitoring the real time location. This Setup consists of Power supply, ATMEGA 328p microcontroller, high volt battery, GPS antenna receiver, LCD, switches and GSM modem etc. The Power supply circuit consists of crystal oscillator, rectifier, transformer, filter and regulator. Transformer is used to steps the household line voltage up or down as required. The Rectifier converts AC voltage in to DC voltage and the regulator fixes

the output voltage to a constant value. Filter smoothes the pulsating DC voltage to a varying DC voltage.

ATMEGA 328p microcontroller, which acts as a processor for the arduino board. It can be controlled by transmitting and receiving the inputs to the external device. The PWM in the ATMEGA microcontroller are used to transmit the entire signal in a pulse modulation. The program required for this project implementation is coded according to the requirement and debugged by using the arduino IDE software. After that it will be incorporated in to the microcontroller for the system function which processing the web server and intimate the information to the students and staff members with the appropriate website link address to view the current location of the bus. Therefore the students/staffs can easily catch their college bus.



Fig 4.2: Tracking System Initialization

The figure 4.2 shows the initialization process of the proposed system. Initially the details such as mobile phone numbers of the students and faculty members who were travelling in the particular bus were uploaded in the ATMEGA microcontroller. Therefore information were sent automatically to the particular person before their bus stop to alert them. It makes people to avoid unexpected delays. The College management can also view the current position of the bus through website. From our Project implementation the process information or the location of the bus details cannot be accessed by any third parties and it improves the schedule of vehicle timing and easy to catch the transport.



Fig 4.3 GSM Initialization

The figure 4.3 explains about the initializing process of finding the positional coordinates of the current bus location. When the circuit switched ON, the GSM is initialized to connect with the web server through internet service. Once it reaches the 75% of the initialization it can able to process with the GPS receiver. After that the position coordinates such as latitude and longitude would be displayed on the LCD board. If the LCD displays wrong value due to compatibility issues, there will be a reset button used to resetting the location again for the current position. Then the switch is turned ON to storage mode used to store the various bus stop locations along the bus route.

The various reset buttons are used to store the respective bus stop location and an erase button is also available to delete the storage details entirely. All the stored locations longitude and latitude would be stored or fully erased successfully by long pressing the respective button. And it also displays the system process information on the LCD board. This storage process of the location's longitude and latitude would have done before implementing the system circuit in its respective bus. The figure 4.4 shows the detecting process of the positional coordinates such as latitude and longitude of the current location of the bus.



Fig 4.4 Detection of current location

After storing all bus stops location details the switch is turned back to normal mode and thus when the bus comes to the stored location bus stop it can able compare with the stored details and predicts the stops after analyzing it. These process were done in a few nanoseconds. After that the GSM

is used to update the server and send information to the students.



Fig 4.5 Confirmation information

The figure 4.5 describes about the information of the bus stop arrival which is displayed on the LCD. The alert messages were sent to the students/faculty members contains the stop information provided with the website link address used to view the location for further details and hence here Google maps were integrated into the program software which is kept stored in the microcontroller. Messages were automatically sent to the respective people when the switch is in normal mode and also the information were passed to the passengers in prior before the bus would reached that destination to alert them.

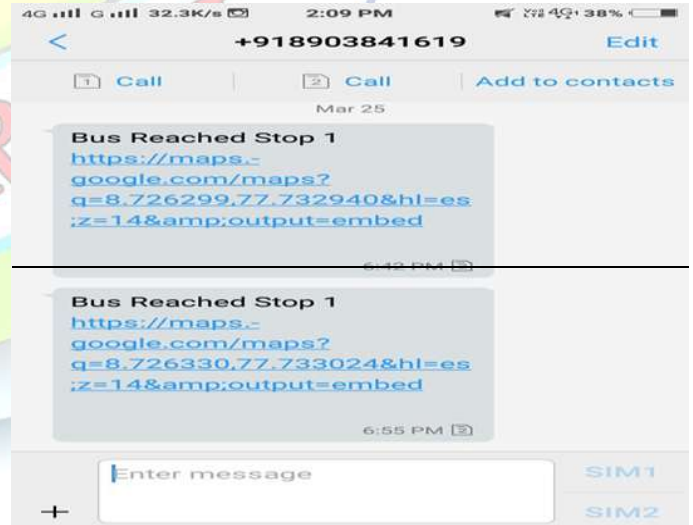


Fig 4.6: Alert SMS in mobile phone

The above picture 4.6 shows the alert messages which were sent through GSM to the particular person. In the daily operation of bus transport systems, the movement of vehicles is affected by different uncertain conditions such as Traffic congestion, irregular vehicle-dispatching times and other incidents. Due to these situations, students may late for



the class because they decide to wait for the bus instead of using an alternate transportation.

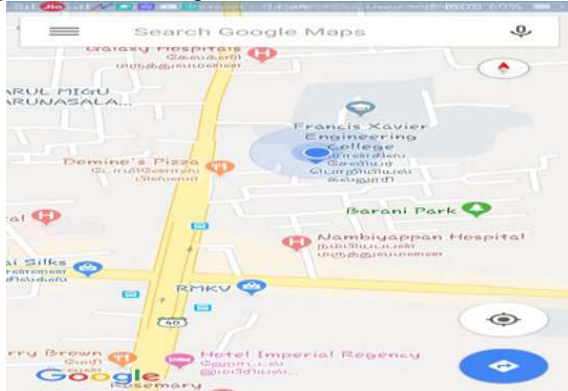


Fig 4.7 View of current bus location in Google Map

The above figure 4.7 shows the view of the bus location which is accessed by the link address sent through the SMS from the server to the respective person's mobile phone. This can be solved by using this project implementation to providing them with more convenience real-time bus location information so they may not get delayed. And also the management monitor the bus movements through the authenticated website and it alerts the unauthorized trips in to restricted areas and identifies aggressive driving habits in terms of emergencies.

IV. CONCLUSION AND FUTURE SCOPE

Today the use of GPS enabled bus tracking system is a must for school and college vehicles to reduce the unexpected delays for both the students and faculty members and thus it can avoid the increasing incidences of crimes. Its major responsibility is to provide exact real time location which comes to the safety of the students while on the move. Besides the management can keep tab on the transportation schedules and make improvements if any. In this project we have reviewed a various existing techniques of college bus tracking. By implementing this idea, we can improve the transportation safety and the quality of services to the college buses.

The system will have latest technology and optimized algorithms with moderate cost. The system may focus on accurate arrival time and position of the bus. This project application will prove beneficial for every bus traveler or even tourists. Not just buses but this application will be useful for every person travelling by any means of transport. The location tracker will give the exact location of the bus which will make it easy for the passengers to travel.

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