SMART COLLEGE BUS TRACKING MANAGEMENT SYSTEM AND ITS APPLICATION

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ABSTRACT—The bus tracking system is a cost effective and efficient system. Using this system four application will be developed. First application is establishing communication between college server and bus system which is capable of providing real-time data regarding the current location of buses. Second application is sending a group messages i.e. alert messages to the students waiting at the next stop, changes in current route, bus number, etc., hence it saves the time of students. Third application is generation of e-bus pass system which is an eco friendly as there is no need of generation of plastic bus passes. Last application is developing an emergency handling system which will send alert messages simultaneously to college, police and ambulance in case of accidents.

KEYWORDS—GPS and GSM Tracking system, student alert system, e-bus pass, automatic accident detection system.

I. INTRODUCTION

The safety of private and public vehicles is a major concern nowadays so having GPS vehicle tracking system ensures their safety while travelling. Vehicle tracking systems are commonly used by fleet operators for fleet management functions such as routing, dispatch, on-board information and security. Other applications include monitoring driving behavior, such as an employer of an employee, or a parent with a teen driver.

A vehicle tracking system is an electronic device installed in a vehicle to enable the owner or a third party to track the vehicle location. It works using GPS and GSM technology designed to continuously monitor a moving Vehicle for doing so an AT89C51 microcontroller is interfaced serially to a GSM Modem and GPS receiver used to send the position (Latitude and Longitude) of the vehicle from a remote place. [1]

The first fully operational GPS/Loran-based vessel monitoring system monitors the workstation, communications solutions, and onboard navigation systems providing an integrated capability for the marine fleet operator. The system is a powerful tool for the fleet operator in such applications as shipping, scheduling, harbor operations, and route verification. Moreover, this concept can be applied to the larger problem of safe transport of hazardous cargo. [2]

To meet the requirements of an intelligent vehicle monitoring system, the architecture integrates GPS, GSM and a Microcontroller in the whole and is used to prevent texting and calling of mobile phones while driving vehicles. If the driver is using the phone while the vehicle is in motion, it triggers a signal which notifies the cops with the vehicle's number plate and the location with the help of GPS system. It receives the mobile signal and detects the presence of mobile. This signal eventually triggers the microcontroller with a glowing LED. Due to the voltage fluctuation, the message is sent to the cops using GSM communication. [3]

The concept for automated navigation and control of a mobile platform utilizes an ad-hoc mobile wireless sensor network to provide navigational information to the mobile platform embedded control system which is realized with an ARM9 SOC based single board computer, with real time, multi-thread software implementation. [4]

A bumper system for an autonomous vehicle is primarily designed for a mobile robot to avoid damage to the robot and to the environment in case of collision, the bumper has some additional properties: reduction of wheel slip during collision, a limited touch-sensing capability without extra cost, and a simple human “push interface”. [5]

An intelligent, automated vehicle tracking system can resolve following problems such as, late arrivals to scheduled, improper use of company time and resources, unsafe driving habits, assigned routes, inefficient dispatching, and passenger’s dissatisfaction. This can lead to better traffic flow modeling and a better

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understanding of driver behavior. It includes various features like ingenuity, simplicity of design and easy implementation. It is completely integrated so that once it is implemented in all vehicles, then it is easy to track vehicle any time. [6]

II. PROPOSED DESIGN

Here two separate modules are developed as shown in figure 1. One is server module present in college and another is the bus module present in college buses.

In server module a microcontroller is connected with GSM, keypad, EEPROM and an alarm. Together this system is connected to college server. GSM system is connected to microcontroller via DPDT relay for dual side message sending. PC interfacing is done to update the EEPROM database.

Server module will receive longitude and latitude value from bus module. This will gives the current location of bus and it can be seen on the map from html file. This will help management to keep track of all buses.

When any student pays the bus fees the details are loaded to college database and in EEPROM of sever module, an e-bus pass will be sent to the registered mobile number of student by GSM of server module. This e-bus pass acts as a receipt and an ID for student and now he can show this message to bus driver and use the bus facility. It eases the burden of student as well as management.

In the bus module a microcontroller is connected to accident detection system, GPS, GSM and EEPROM. Here also PC interfacing is possible for updating the EEPROM database.

When bus start moving from one stop to the next the bus module start calculating the distance and when threshold reaches the system automatically sends message to all the members of next stop using GSM module.

The accident detection system has two main operations, one is manual and other is automatic. In manual system three switches are provided. Driver can press these switches in case of brake failure, engine failure and tyre punctures. When driver presses any of these switch messages will be sent to college and mechanic. This message constitutes the location type of problem occurred and bus number.

In college server module one alarm is attached. If any such message arrives, this alarm starts ringing. The automatic system triggers when piezosensor senses the shock, the comparator and equalizer matches the shock
signal with threshold if threshold limit is crossed automatic messages are sent to college, ambulance and police about the accident location. This application is very important in case of any accident. In college the alarm is set as soon as accident detection message arrives.

III. IMPLEMENTATION
To implement the tracking system we need to separately analyze both the sides. Flow diagram explains how the program will initialize the system and their other operations.

First it shows the initialization process of the system when bus starts. Memory condition is checked and if any problem found, system reset itself. Also it checks whether the sensor is connected to controller or not. A serial interrupt checks for GPS data ($gprmc format), if found the value is returned to controller. A timer interrupt checks for duration and after every 5 minutes GPRMC value is extracted and sent to the controller as shown in figure 4.
Driver keys are checked and if they are found switches are checked. After 30 seconds the program will calculate the next stop distance. Simultaneously shock pulses are also monitored. In each case if any of these conditions are found true an interrupt will be generated and system will jump to next step, which is shown in figure 5.

On server side also first the system initializes itself and memory status of database is checked. If faulty memory is found then system reset itself. After that GSM and keypad is configured and prepare the system for reception of alert from bus, which is shown in figure 6.

The flow diagram shown in figure 7 explains the processing of received messages and their display. Basically three types of messages are received, which are location update, bus technical problem and accident alert. All the messages will generate Google map link which will point the bus on map.
As seen in flow diagram shown in figure 8 whenever any key pressed between 1 to 9 various operations takes place such as updation of database and generation of e-bus pass or e-ticket and so on.

![Flow Diagram](image)

**IV. RESULT AND DISCUSSION**

One out of four application is discussed here:

Accident detection sensor continuously senses the shock. When any shock is detected the controller displays the shock sensed message and uses the GPS module to obtain location of the bus latitude, longitude, date and time these values are extracted from the GPRMC component of GPS output. All these retrieved values are sent to server side i.e. college, police and ambulance via GSM module.

![Images](image)

**Fig 9:** shock sensed, accident detected, getting location of bus (latitude and longitude values), date and time values, sending message to college and sending message to ambulance

**Fig 10:** tracking the bus in google map

**V. CONCLUSION**

The Smart college bus tracking system uses the wireless communication technique and was successfully designed and tested for real time data. The system has the advantages of small size, low costs, full-featured and powerful expansibility. It can be easily installed and used in the buses to ease the burden of transport department as the educational institutions have large number of buses. This system is based on embedded system and can also be developed on android platform.

This is an intelligent and sophisticated mobile vehicle checking system that could keep-up with fast infrastructural growth and road infrastructure development. This system proved to be much more efficient and produced good results such as:

- Sending location of bus to college in every 3 min
- In case of accident sends Alert to college, police and hospital
- In case of bus failure driver can select the problem and inform college and contact the Mechanic automatically
- Finding bus location with respect to stop number
- If the bus is in the range of 500mtrs - 2000mtrs, Send alerts message to the student before the bus arrives their stop
- Addition/update/deletion of student database is easy
- Generation of e-bus pass hence eco friendly
REFERENCES


