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BUS NAVIGATION SYSTEM USING GSM & GPS MODULE

Dr.Gnanasundari.P, Professor,
Department of ECE, SNSCE,
Coimbatore, India.
sundaribalakrishna@yahoo.co.in

Valarmathi K R, Subathra B, Sushmeetha R R, Steji M, B.E(Student),
Department of ECE, SNSCE,
Coimbatore, India

ABSTRACT

In Private or Public Transport system, analyzing the count of passengers in the vehicle becomes a critical issue. Sometimes the vehicle drivers and workers used to swindle by permitting the travelers to occupy the unreserved-empty seats in bus without the knowledge of their owners and make profit out of it. A real time bus-monitoring system is required to overcome this issue and monitor the bus for Travels proprietors. The main objective of this Bus navigation system is to provide information to the owner of the vehicle about the count of the passengers and the location of the vehicle during the journey through SMS at any instance. It helps for the real time monitoring in Public and Private Transport system.

Keywords: *Private or Public Transport system, PIR sensor, Arduino, GSM & GPS, Swindle, SMS.*

I. INTRODUCTION

In the rapid growth of smart cities, Transportation is the major department where in many technologies are developed to ease the work. Travelling in bus is one of the major aspects that every human does in their day-to-day life. This bus journey may be far or near, yet it is essential in our daily routine. Many systems proposed were helpful to the passengers to know the location and the time of arrival of the bus.

After the implementation of online ticket booking, People reserve their tickets in the Public/Private transport system for their long travels.

Because of inevitable conditions, the passenger may not be able to travel in the same bus where he/she booked the ticket. In such cases, drivers and workers permit the other unreserved passengers to occupy vacant seats without the knowledge of vehicle owners and try to swindle them. Thus, corruption takes place there, which leads to loss in income to the vehicle Owners.

To reduce this problem, a system is designed using embedded systems and communication systems in which an arduino microcontroller is connected with a GSM sim908/GPS module in association with IR sensors and PIR sensors. The sensed signals are processed in the arduino microcontroller and the received co-ordinates of the vehicle's current location from the satellites is also stored in arduino. The stored information about the co-ordinates and the sensor's count values in arduino are sent to the user through messenger application. By this process, the user can view the count of passengers and location of the vehicle instantly. This improves smooth and linear transportation system.

II. RELATED WORKS

The existing systems focused only to reduce the hardships faced by normal passengers and visually impaired people. The existing bus navigation systems were used to display the arrival time and current location of the vehicle in the bus stops or bus units. Some systems either uses Pic controller or wireless sensor technology along with Zigbee or GPS/GSM modules to help visually impaired people to know the bus location. In those systems, a sound systems placed in the Bus stop is used to announce the bus number, the time of arrival of that particular bus to the bus stop and the current location of the bus.

An Intelligent Bus monitoring existing system is used to show the location of the bus and arrival time of the bus to the passengers. In some other cases, the location of the theft vehicle can be found using this system that uses the GSM/GPS technology with PIC microcontroller. The application of that tracking system was to promote Anti-theft of vehicles. Most anti-theft systems, uses mobile-phone applications integrated with either Google maps or SMS application, which shows the coordinates of the target location.

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Urban transportation systems were deviced in such a way that the LCDs placed in bus stops shows the city map along with the location of the vehicle to the passengers. This information can be predicted by using GPS technology, which sends the information to central monitoring system in order to display the data in the city map and this helps in public transport system. This type of system is known as Smart onboard Public Transport System.

Some of the applications use RFID with ETA algorithm to maintain the real time monitoring of passengers in the vehicle. The owner was able to monitor the bus driver actions and also track the vehicle's location. The movement of the vehicle can be controlled by the processors like arm processor or controllers like atmega controller in the vehicle with the help of GSM and GPS module.

In remote applications, GSM/GPS technology was used to track a stolen vehicle or to make a continuous monitoring of the particular vehicle. This system also stores the route history of the vehicle and the coordinates of the travelled location were sent to the user. This technique was used to monitor the red-handed intruders or criminals by inserting a chip into the target person's body without his/her knowledge.

For security purpose, this system uses RFID with GSM/GPS technology. A cab driver would swipe his RFID card in the reader unit, which is placed in the car. If it matches, then the driver's information will get stored in employee database. In case of emergency or critical conditions, the employee could press the alarm button provided there immediately. After this action, the cab number, driver name and location of the cab were informed to the police and the employer and the microcontroller signals to stop the car instantly.

III. IMPLEMENTATION DETAILS

A.HARDWARE

The hardware components used in bus navigation system are IR sensors, PIR sensors, Arduino Uno R3 and GSM & GPS module.

1. IR SENSORS

Figure 1 shows the IR sensor. IR Sensors produces a logic 1 signal when there is an interruption in the IR field between 1-3cm. This distance can also be varied by adjusting the potentiometer.

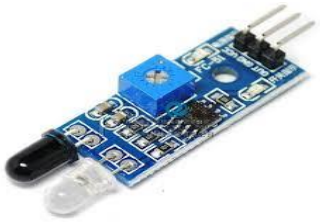

Figure 1 IR sensor

2. PIR SENSORS HC-SR501

This pyroelectric motion detection sensor detects the motion by measuring the IR level emitted by human at a wavelength of 12micrometer. It produces a logic 1 signal which is sent to the arduino processor. Here, the delay time / blocking time are also made adjustable by using the potentiometer's on-board. Figure 2 shows the PIR sensor.

Figure 2 PIR sensor

3. ARDUINO UNO R3 ATMEGA328

In this microcontroller, programming ATmega328 without a bootloader is made so that our programs can be completely override the flash of the microcontroller. The main advantages are the immediate execution of our program when the Atmega power is switched on and more memory space is available in this microcontroller. Figure 3 shows the arduino uno R3 atmega 328.

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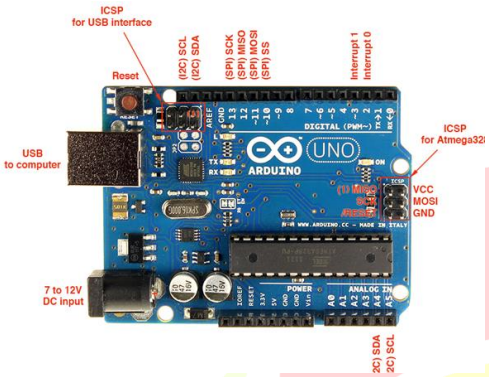

Figure 3 Arduino uno R3 atmega 328

It contains 14 digital input/output pins and 6 analog pins. The inputs of the sensor unit and sim908 module are given to digital pins and the LCD display is also connected to arduino in order to verify the output. The power is supplied to the arduino either by using adapter or through USB cable.

4. GSM & GPS MODULE SIM908

It is the one in which the GSM & GPS module were integrated together in a single module as sim908. It is a quad-band GSM/GPRS module which supports GSM 800MHz,EGSM 900MHz, DCS 1800MHz and PCS 1900MHz. CS-1,CS-2,CS-3 and CS-4 GPRS coding techniques. The GPS offers best acquisition , tracking sensitivity, Time-to-First Fix(TTFF) and accuracy. The audio channels are configured using AT command. Figure 4 shows sim908 GSM/GPS module.

Figure 4 sim908 GSM/GPS module

It contains 40 pins with 7 serial port pins, 6 keyboard interface pins, 4 SIM interface pins, 2 status pins and a pair of GSM/GPS RF interface pins. The sim908 is configured with the navigation system using the AT command in Arduino IDE which is processed in arduino to initiate the tracking process and to receive the location co-ordinates.

B. SOFTWARE

1. ARDUINO IDE

This Integrated Development Environment provides the arduino programming in simple C. The Arduino development environment contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions, and a series of menus.

The USB port is connected to the Arduino hardware to upload programs and communicate with them. These programs can be in normal Arduino code file (no extension), C file (.c extension), C++ file (.cpp), or header file (.h).

Program Fusing

Before uploading sketch, it is needed to select the correct items from the **Tools > Board** and **Tools > Serial Port** menus. When the sketch is uploaded to the arduino board, the RX and TX LED blinks. The Arduino environment will display a message when coding upload is complete, or it will show an error.

While uploading a sketch using the Arduino **bootloader**, hex program get loaded on to the microcontroller board.

Libraries

Libraries provide extra functionality for use in sketches, e.g. working with hardware or manipulating data. To use a library in a sketch, select it from the **Sketch > Import Library** menu. This will insert one or more **#include** statements at the top of the sketch and compile the program.

IV. PROPOSED SYSTEM

In this system, a bus is set up with a pair of IR sensors in doorsteps, PIR sensors above the seats, GSM/GPS module and arduino microcontroller. Figure 1 shows the block diagram of Bus Navigation System using GPS/GSM module.

Initially when the bus is get started, the GPS module tracks the coordinates as zero and GSM will send this information to the user. Then at regular

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intervals, the information about the status of the bus will be send to the user automatically.

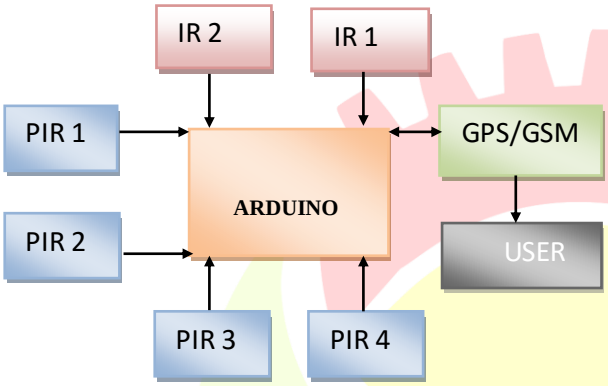

Figure 5 Block diagram of Bus Navigation System using GPS/GSM module.

When a person enters into the bus, the IR sensor at doorsteps gets interrupted. After this interruption, the count of person is incremented. Then the person is detected by the PIR sensor and it is also processed in the processor. Figure 5 shows the block diagram of Bus Navigation System using GPS/GSM module.

When a person leaves the seat, the PIR sensor produces a low signal and send it to the arduino for further decrement process. And also IR sensor gets interrupted in a way that IR2 and then IR1. Both the signals are taken into account and this signals stores the decremente value in arduino.

Simultaneously the GPS module tracks the coordinates of the location and this data is sent to the user by GSM module. In this way periodic monitoring can be done by the owner of the vehicle.

V. RESULT & FUTURE WORKS

The user can view the obtained result in a messenger application, which contains the PIR seat count, IR sensor count, and the location coordinates.

When the module is switched on, it sends a message which contains the zero count of passengers and zero coordinates to the user. Thus the module is initialized. After the preset time the user gets the updated message about the count of passengers from sensors and coordinates of the location from GPS module, which are send through GSM.

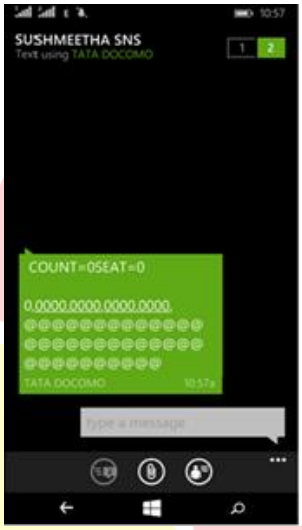

Figure 6 Initial output

Figure 7 Updated output

Figure 6 shows the message received by the user when the module is initialized and the figure 7 shows the message received by user after 2 minutes send by GPS/GSM.

In future process, the passenger on reserving ticket receives a QR code which is scanned while entering and leaving the bus. Thus, the user can able to get the passenger count by this method.

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