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GSM-Based Tracking on A Real Time Bus Location and Implementation for Institution Transport

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Abstract: ***Transportation security service includes vehicle tracking of a system by embedding an electronic device in a vehicle or fleet of vehicles. The main aim of the project is to provide automation in the institute transport system by inculcating the location based tracking, counting and communicating the student's strength in the bus to transport office. The ATMEGA16 microcontroller is used for the process management. Ultrasonic sensor is used to count the students entry into the bus and the 7-segment display is used for the view. GPS and GSM module has RRLS (Radio Resource Location Service) protocols to communicate and the modules are interfaced for the better performance of the transportation service system. More over to reduce the manual effect an automatic wiper system is installed with a motor control system based on the rain fall.***

Keywords: GPS, GSM module, ultrasonic sensor HC-SR04, rain sensor E46, seven segment display, wiper motor**.**

1. Introduction

The Real Time Implementation of GSM Based Bus Location Tracking is a system which is used to find the location of the bus movement on the road, by using the GPS and GSM module the location of the bus is tracked with latitude and longitude identification. This information is send as message to the server [1]. This system is interface with the battery to power the module and microcontroller. The student's entry count is displayed using the seven segment display and the counted value is send as text message to transport office with the help of push button pressed by the driver. The ultrasonic sensor is interfaced with microcontroller to count the number of students entering into the bus. The counted values can be send as text message to transport office via GSM. The system comprises of GSM, display and sensors which are interfaced with the microcontroller to locate the bus location and the student's strength in the bus. These two processes will be intimated through the SMS to the transport office [5].Many technologies are available for the tracking the public and private transports. Like solider tracking, vehicle tracking, wild life tracking, heartbeat measurement etc. In this tracking vehicle tracking is good this application. Vehicle tracking is to monitor speed and various locations, accident detections etc. This tracking process is used to find the location of the bus in movement, traffic jams and breakdowns [7]. Mostly the counter process is used in the railway station for passenger's entry tracking, counting and displaying the number of entries in the display [6]. The bus tracking system offers the real time bus location information service with significant cost [5]. The latitude and longitude message in tracking process is used to search the location of the bus in the Google earth map. The accurate place of bus can be found via GPS and GSM through Google map and the number of students in the bus is counted and the counted value can be intimated to the transport office [10]. This process aids the institution transport office to locate the bus and also to determine the strength of the students in the bus. The automated wiper action system controls the speed of the wiping by sensing the density of the rainfall

2. Block Diagram

Bus location tracking system block diagram is shown in Figure.1. The important blocks in the tracking, displaying and communication system are GPS and GSM module, processing unit, sensing module and displaying module. Ultrasonic sensor in the sensing module senses the students entry, the output of the sensor is processed using counter in the processing module implemented using Atmega 16 microcontroller. The counted values are displayed in the bus and the same time will be sent via text message to the transport office by use of the push button, the status of the process is indicated by an RGB LED visually to the driver. Under normal operation red led blinks indicating the system is active, once the driver initiates the process by pressing the button the led changes to blue. When the process completed led changes to green. Automated wiper action aids the wiping process by automatically controlling the speed of the wiping action by sensing the strength of the rainfall. Automated wiping and manual wiping mode can be selected by the driver. In auto mode three levels of wiping can be implemented such as low, medium and fast.

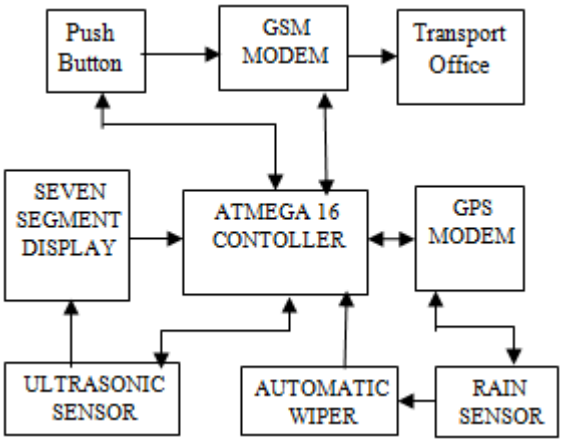

Figure 1: Bus location tracking system

2.1 ATMEGA16 Microcontoller

AVR is 8-bit RISC architecture microcontroller. These microcontrollers are available in 16-bit and 32-bit. It has 140 single cycle instructions. AVR can operate with 8 and 16 MHz clock period. ATMEGA16 is a 40 pin microcontroller with four 8-bit ports with inbuilt USART, I^2C interface, PWM channels and 10 bit ADC. It has 4 PORTS with 8 pins in each port.

2.2 GPS and GSM Module

Global System for Mobile communication (GSM) is Standard used for mobile communication in Europe and other countries. General Packet Radio Service (GPRS) enables higher data transmission rate which is an extension of GSM. GSM/GPRS module consists of a GSM/GPRS modem, a power supply circuit and communication interfaces like RS-232, USB; etc. The MODEM is the soul of such modules. (UMA) unlicensed mobile access technology is basically a mobile-centric version of 802.21.it used between GSM and Bluetooth. The GSM module is connected with ATMEGA 16 in PORT D with pin PD0 and PD1. The PORT D is default for transmitter and receiver. The GSM transmitter is connected with PD0 and receiver with PD1.

2.3 Ultrasonic Sensor

Ultrasonic sensors HC-SR04 is used in this project, they are also known as transceivers because they do send and receive operation at a time. Generally they are called as transducers which work on a principle of RADAR. An active ultrasonic sensor produces high frequency sound waves and calculates the echo received back by the sensor. The distance to an object is calculated by measuring the time interval between sending time of the signal and echo reception time.By measuring the time duration from the transmission to reception of the ultrasonic wave, it detects the position of the object. This sensor is connected with PORT A of ATMEGA 16 controller which has +5v supply.

2.4 Rain Sensor

A rain sensor E46 is a switching device which is activated by rainfall. Total internal reflection is the principle behind the modern rain sensors. An infrared light is beamed at 45^o angle into the windshield from the interior if the glass is wet, when the light is less which makes it back to the sensor, and then wipers turn on. Most of this aspect of the car does not stand.

2.5 Seven Segment Display

A seven segment is available in 10 pin package, while 8 pins corresponds to eight LEDs of seven segment display and the remaining 2 pins (at middle) are common and they are internally shorted. There are two configurations in these segments. They are, Common Cathode and Common Anode. In all the LEDs CC is the structure, D negative terminals are connected by common pins . when given a specific LED glows Common ground is connected and its associated pin high. The IC is used in display is ULN2003 and it operates in +12v supply. It can be connected with PORT C and PORT B of ATMEGA 16 controller.

2.6 Automatic Wiper

The battery or power supplies will give power to the sensor and the rain operated motor. During rainfall, the Wiper motor is automatically ON. On the glass of the vehicle the senor is fixed. The sensor used in the proposed system is a conductive or rain sensor. It senses the rainfall and gives signal to the control unit. The control unit activates the motor of the wiper automatically.

3. Bus Tracking System Simulation

The simulation for the real time implementation of GSM based bus location tracking and computation for institution transport is done using the software tool ISIS professional PROTEUS. PROTEUS is a Virtual System Modelling and circuit simulation application. The suite combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-simulation of complete microcontroller based designs. Proteus also has the ability to simulate the interaction between software running on a microcontroller and any analog or digital electronics connected to it. It simulates Input / Output ports, interrupts, timers, USARTs and all other peripherals present on each supported processor. The corresponding design specification is achieved through the compiler software AVR STUDIO 4 for ATMEGA 16. Figure.2 shows the tracking device placed in LCD.

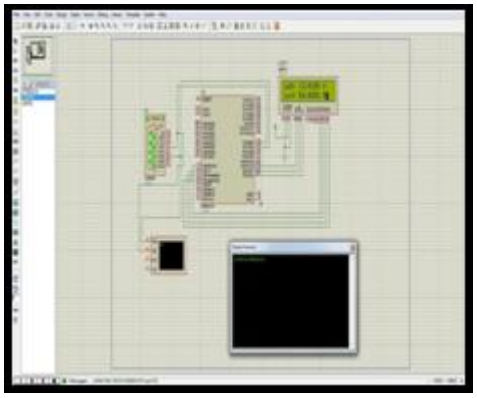

Figure 2: Tracking Device Placed in LCD

Figure 3Shows the counter design and sending message using the terminals. Display on the seven segment display is also shown.

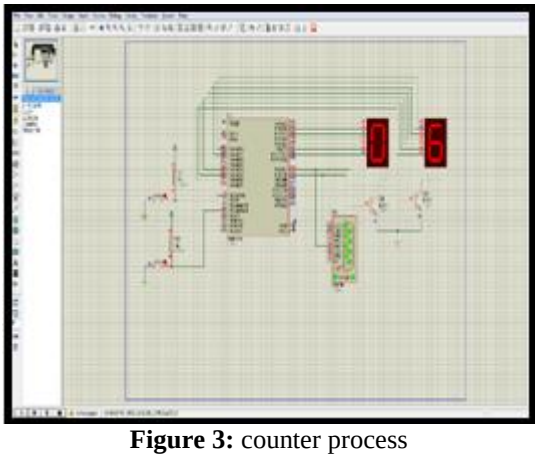

Figure 3: counter process

4. Simulation Results

The simulation results are shown through the following figures. It describes the working function of the peripherals, which is connected with the controller. The device gets the information from database server by using GSM and GPS, display those details through LCD. The details include bus location, bus speed, date and time. Latitude and longitude location of bus can be searched via Google map.

Figure 4 Output Message for GPS

Like the same way of tracking the students count inside the bus which is displayed in the 7-seg display is transmitted through GSM as a text message when a push button is pressed by the driver at any stage of motion regarding power supply is provided. Figure 4 shows the output message for GPS in the destination mobile phone. Figure 5 shows the interface between Computer and GSM and Figure 6 shows the output message of student counting bus to the college mobile phone

Figure 5: Interface between Computer and GSM

Figure 6: Output Message of Students Count in Bus

5. Hardware Description

The controller board has the ATMEGA 16 microcontroller with 7085 voltage regulator. It has input of 7V to 16V and constant output 5V. MAX232 will convert TTL to RS232. Capacitor functions are used to store the changes and boost the voltage. In this bridge rectifier are used it has 4 diodes. The crystal oscillator of ATMEGA 16 is 16MHZ. The supply voltage is +12v for the development board. Figure6 shows the structure of ATMEGA 16 development board and Figure.8 shows hardware kit with controller.

Figure 7: ATMEGA 16Development Board

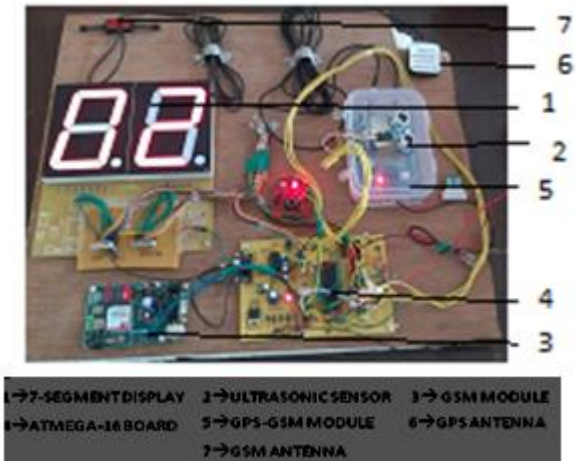

Figure 8: Hardware Kit with Controller

1. Rain sensor 2.wiper blade 3.wiper motor
4. Relay 5.potentiometer

Figure 9: Hardware kit for automatic wiper

6. Conclusion

The schematic circuit design for GSM based bus location tracking and computation for institution transport was designed which has three parts GSM modem, seven segment display, ultrasonic sensor and database server. This design was developed by embedded C code by interfacing with GSM, GPS display and ultrasonic sensor by using AVR STUDIO 4.1. The schematic circuit was developed by the

use of ISIS professional 7 PROTEUS software. It is enhanced method after completing this method, move on to various versions to develop this process. The automatic wiper also be developed with kit.

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