International Journal of Scientific Research and Engineering Development-– Volume 2 Issue 1, Jan-Feb 2019
Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

School Van Tracking Using SMS

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Abstract:

This paper proposes a Real-Time School Bus Tracking Application which runs on Android smart phones. The project helps in real time tracking of school Bus to parents as well as to school management. The project also sends information to parents about their ward entry and exit from the Bus. . The main purpose of this application is to provide exact location of the student's respective buses in Google Maps. It is a real time system as the current location of the bus is updated every moment in the form of latitude and longitude which is received by the students through their application on Google maps.

Keywords: RFID, SPI, GSM, UART, NMEA, IOT, Servo Motor.

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I. INTRODUCTION

The paper is based on arduino based hardware platform. The system uses a Radio Frequency identification system to identify the student's entry. Upon detecting students entry system sends SMS to the parents of student. When bus reaches school and students swipes his card in the system, a SMS is sent to parent again to about his exit from the Bus. The system also monitors the Bus location on google map and provides an android application for monitoring the location of bus. Children around the world spend an inordinate amount of time traveling to and from school. Many children in developing to developed nations use school buses which may or may not be regulated by the government. What happens inside a school bus including the environment, the amount of time took etc. is generally not known. A part of smart education is to bring more transparency into what goes on in a school bus and to take appropriate regulatory and policy actions based on such data. For example, there should be constraints on the maximum amount of time a child spends on a school bus as well as the environmental, safety and traceability aspects of where a child is. This paper proposes a system which instruments each school bus with sensors that collect information about the conditions in a bus and transmit it in real time to a server using the telecom infrastructure. This information about each bus is then analyzed and reports are generated for the school as well as for the Ministry of Education on various aspects like environment, time, safety etc.

II. PROBLEM DEFINITION

We do not have any system available, which provides information to parents about their ward presence in school Bus. So once students leave for school, parents does not have any information about their entry into the school bus, arrival to school, departure from school etc. The school management also does not have any method of tracking the school bus position. The school management is completely dependent on Bus drive and Bus attendant to provide the Bus position in case of any requirement.

III. PROPOSED SYSTEM

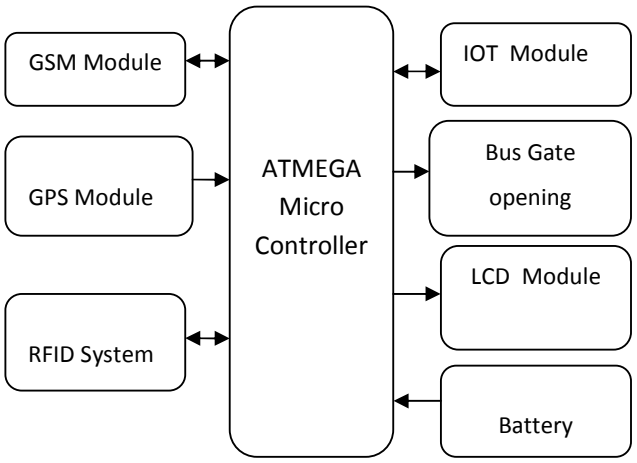
The proposed system uses RFID (**Radio Frequency Identification**) for identifying the student and fetching his database. Each student is issued with a unique RFID card (Smart Card). The student's parent mobile number is stored in the microcontroller. The system consist a RFID card reader, the reader communicates to microcontroller through SPI

(**Serial Peripheral Interface**) protocol. Whenever student swipes his/her RFID card, system checks the validity of card. Once the RFID card matches with the database stored into the system, it opens the Bus Gate and allows student entry into the Bus. At the same time system sends SMS to student's parent about their entry into the School Bus. The SMS feature is implemented in the system through SIM800 module, which works in GSM (**Global System for Mobile**) mode. The SIM800 module communicates to microcontroller through UART (**Universal Asynchronous Receiver/Transmitter**) Port.

At school once student gets down from the Bus, he/she needs to swipe the card again. At that time system sends a SMS to student's parents along with the position information of the Bus. The position information of Bus is detected using GPS (**Global Positioning System**) module. The GPS module communicates to microcontroller through a UART Port. We are using Neo-6m GPS module in this project. The GPS module provides current location Latitude and Longitude information every second. This information from GPS module is encoded in NMEA (**National Marine Electronics Association**) 0183 format. The information is read in the microcontroll

er and decoded by the microcontroller. The similar process repeats once student gets into the Bus from school to Home.

IV. BLOCK DIAGRAM



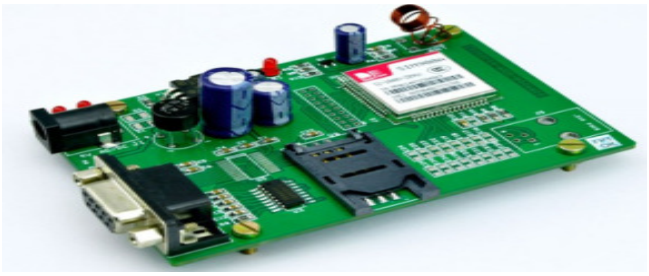


Fig 1. Block diagram

V. HARDWARE AND SOFTWARE REQUIREMENTS

- Arduino IDE
- Embedded C programming
- Arduino Mega Board
- IOT Module
- GSM Module
- GPS Module
- Servo Motor
- RFID Module and Cards
- LCD Module
- Battery
- Wires
- Resistors and Capacitors
- Voltage Regulator Circuit

The system uses an 8 bit ATMEGA microcontroller board. The system has a GPS module, which gets the location from satellites and provides it to microcontroller. The microcontroller decodes this information and keeps updating in its memory.

Whenever a student enters into the bus, she/he needs to scan their card in front of RFID scanner. The RFID scanner detects the unique ID of RFID card and provides it to the microcontroller. The microcontroller compares and matches the unique id with stored IDs. Upon successful validation, microcontroller opens the gate and sends the SMS to student parent about their entry into the BUS. To send the SMS we are using GSM module. This module communicates to microcontroller via UART/Serial port.

The system also enables school management to track position of the BUS on google map. For this purpose we have built an android application, which gets bus live location via IOT. The received information about location is plotted on the mobile application. All the functionality of microcontroller is displayed on the 16x2 LCD screen. The complete system works on 12V battery.

VI. COMPONENTS

A. GSM Module

GSM modem to communicate over the mobile network.

Fig. 2 GSM module

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.

B. GPS Module

A **GPS tracking** unit is a navigation **device**, normally carried by a moving **vehicle** or person, that uses the Global Positioning **System** (**GPS**) to **track** the **device's** movements and determine its location

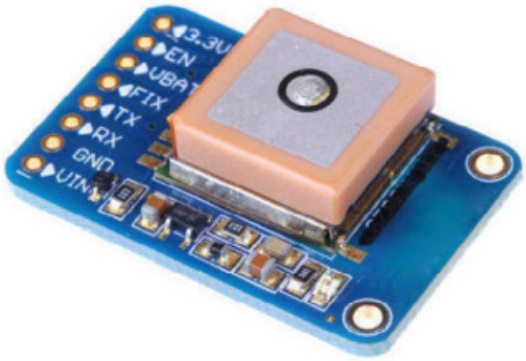


Fig. 3 GPS module

C. RFID System

Fig.4 RFID system

RFID (radio frequency identification) is a form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person

E. IOT Module

Fig. 5 IOT module

The Internet of things is the internetworking of physical devices, vehicles, buildings, and other items— embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-tomachine (M2M) communications and covers a variety of protocols, domains, and applications.

D. ATMEGA Microcontroller

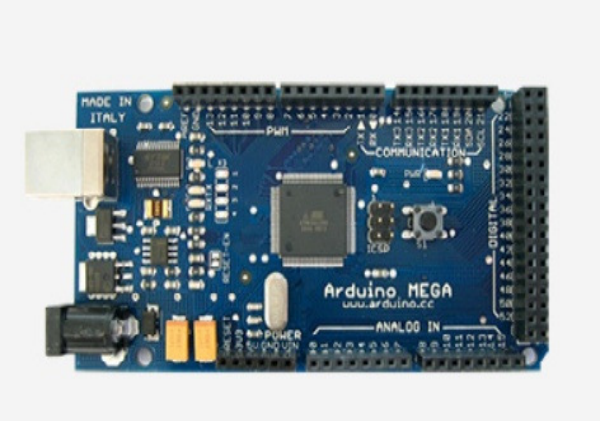


Fig. 6 ATMEGA microcontroller

The Arduino MEGA ADK is a microcontroller board based on the ATmega2560. It has a USB host interface to connect with Android based phones, based on the MAX3421e IC. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

F. LCD Module

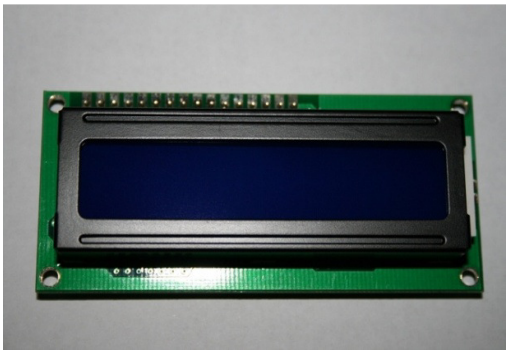


Fig. 7 LCD module

LCD (Liquid Crystal **Display**) screen is an electronic **display module** and find a wide range of applications. A 16x2 **LCD display** is very basic **module** and is very commonly used in various devices and circuits. These **modules** are preferred over seven segments and other multi segment LEDs.

LCD (**liquid crystal** display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, **LCDs** allow displays to be much thinner than cathode ray tube (CRT) technology.

G. Servo Motor

A servo motor is a rotary actuator or motor that allows for a precise control in terms of angular position, acceleration and velocity, capabilities that a regular motor does not have. It makes use of a regular motor and pairs it with a sensor for position feedback. The controller is the most sophisticated part of the servo motor, as it is specifically designed for the purpose.

Fig. 8 servo motor

VII. APPLICATIONS

1. The system can be implemented in all the school buses. It can also be used for higher degree college Buses as well. Part of the system can be used for MNC bus service as well.
2. The Bus location can be shared to employees on internet.
3. This will help employee to reach on time to the Bus stop and reduces the waiting time for staff on the Bus stop as well.
4. With some modification this system can be very useful for proving solution to city bus tracking
5. Allowing parents the ability to see the real-time location of their child's bus,the Safestop app from Safestop app provides user with estimated arrival times.
6. Parents or guardiance can also receive notification about the bus,such as accidents or heavy traffic. In additional

transportation professionals can use SafeStop analytics to track performance by comparing planned routes versus actual data collected by the GPS units.

VIII. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

1. Online tracking of school Bus position
2. No dependency of Bus staff for providing Bus current position to school management
3. No disturbance to Bus drive for calls during driving hours for informing the position of Bus
4. Parents get SMS notification
5. Parents are well informed about their kids presence during school hours
6. Authentication of students happens automatically through RFID cards
7. Increase safety and security
8. Improve time management
9. Manage fuel costs
10. Provide greater accountability for workforces

DISADVANTAGES

1. Monitoring system needs to be maintained, which is extra cost to college management
2. System consumes electricity than earlier required

IX. CONCLUSION

The paper demonstrates the real time tracking of school bus, which is capable of notifying parents via SMS when the child enters/leaves the school enabling School authorities and parents to keep track of the bus online, helping smooth and quick rides to the different destinations

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