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RFID and GSM Based School Bus Tracking System

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ABSTRACT: Now-a-days with the increase in the crime rate and accidents parents have worry about their children when they are going to schools. To get rid of this fear they need some systems to know the status of their children, this paper is one of that kind. It has two units BUS UNIT and SCHOOL UNIT. BUS UNIT consists of RFID Reader, different sensors and GSM module to issue the alert messages to parents when their children boards or leaves the bus. Temperature sensor, gas sensor, accelerated tilt sensor will be placed within the bus unit to detect fire, gases and tilting of bus and issues alert messages by giving the location of the bus using GSM and GPS modules. SCHOOL UNIT consists of RFID Reader and GSM Module. The entire data in two units will be processed by using ARDUINO UNO ATMEGA 328 Processor.

KEYWORDS: RFID; GSM module; GPS module; ARDUINO UNO, Sensors.

I. INTRODUCTION

At present days all are very much aware about the safety concerns. At the same time parents can admit their children in schools which have high reputation and all facilities. Now-a-days all schools have bus facilities, even though their child are going to school through school bus parents have some worry about their child, are they reached safely or in a dangerous situation[5] (e.g. when bus met with accidents then they need help [1]). This paper gives solution for this question.

This paper proposed a system to detect accidents using sensors like accelerated tilt, temperature, gas and smoke sensors. This system also issues alert messages when child boards and leaves the bus using the RFID tag which was wore by the child by placing that tag before the RFID reader [2]. These sensors and RFID reader are interfaced with ARDUINO UNO board which has ATMEGA328 processor. The outputs of this ARDUINO UNO board are given to GSM module and LCD display. This GSM modem can sends the messages to authorized persons according to the received data [4]. LCD displays the message about the accidents [4]. This total system will be presents in bus, which is called BUS UNIT.

Here a SCHOOL UNIT is also there which have ARDUINO board, RFID Reader and GSM Modem. This unit will issues the messages to parents to con-vey them that their children are reached the school safely, and they are in the school premises.

II. LITERATURE SURVEY

Our project idea is to put an end to incidents like Innocent children are ending their lives for unworthy reasons [1]. There are many systems which provide security to the school children. The use of RFIDs makes it easier to maintain and usage, but could not give the certain formation about the situation in the bus i.e....this system is it does not provide any information when children are in dangerous situations [2]. To track the live location of the bus for the speedy recovery when it is subjected to accidents[3].To intimate the school management and parents about the hazardous

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situation in the bus[4].to avoid the rash driving and to intimate when the bus is subjected to tilt Our paper devised a method to identify the students are dropped at correct locations and if they are dropped elsewhere the location is identified and alert is sent to parent. [5].

III. PROPOSED SYSTEM OVERVIEW

A. BLOCK DIAGRAM

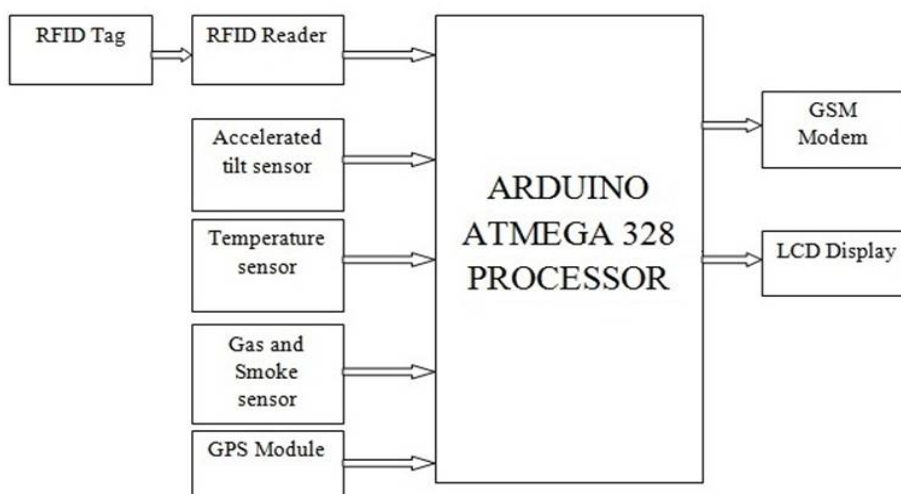


Fig 1. Block diagram overview of the system

Figure1 clearly explains the whole proposed system. The main component is the ARDUINO ATMEGA328 processor, all the sensors and the RFID reader, GPS module are given as the inputs to the processor. The processed data will be displayed on LCD display [4] to convey to the driver about the situation, and this processed data will also be conveyed to authorized persons through GSM modem. Now the clear description of the components in the system are given below clearly



Fig 2. ARDUINO UNO board

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

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B. RFID TAG

There are two types of RFID tags. They are passive tags and active tags. Active tags have battery and continuously broadcast their own signal, they provide much longer read range than passive tags [4]. Passive tags don't have internal power source, they are energized by the electromagnetic energy transmitted from an RFID reader.

Below figure gives the inside view of the passive tag. A passive tag has an antenna and a chip. Tag antenna receives signal from reader and powers the chip, this signal can be modified according to the unique information present in the chip and retransmitted through antenna.



Fig 3. RFID Tag.

For this system passive tag is the correct one because they have short reading range which fits to our requirement to detect the child when he/she is close to the reader.

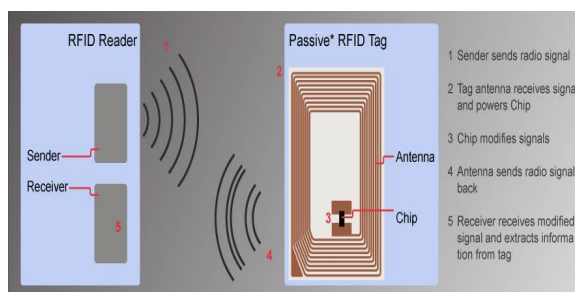


Fig 4. RFID Reader and Tag.

The above figure shows how RFID reader and tag can exchange the information.

C. RFID READER

There are three types of RFID readers based on their frequency ranges, low frequency, high frequency and ultra-high frequency.

This EM-18 is a low frequency (125 KHz) RFID reader with serial output with a range of 8-12cm. It is a compact unit with built-in antenna and can be directly connected to the PC using RS232 protocol [4]. It is an inexpensive solution for this RFID-based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply.

D. ACCELERATED TILT SENSOR

The ADXL330 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs, all on a single monolithic IC. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. This sensor is interfaced with ARDUINO UNO board. The sensed data will be processed by the Atmega 328 processor and is transmitted to authorized persons using Global System for Mobile communication (GSM).

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E. GAS SENSOR

MQ6 is the gas sensor which suits to this requirement. It has high sensitivity to Propane, Butane and LPG and it also respond to Natural gas. This sensor is interfaced with Atmega 328 processor and sensed information will be transmitted to respected persons through GSM.

F. TEMPERATURE SENSOR

The LM35 is a temperature device with an output voltage linearly proportional to the Centigrade temperature. The operating voltage is from 4V to 30V, range of this device is from -55°C to 150°C . Accuracy of this is about 0.5°C . It has three pins 1st pin is power supply pin, 2nd pin is output pin which is connected to arduino board, and 3rd pin is the ground pin.

G. GSM (GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS)

GSM was developed by the European Telecommunications Standards Institute (ETSI) which de-scribes the protocols for 2G cellular networks used in mobile phones. It is operating over 219 countries and territories. GSM is implemented using narrow band time division multiple access (TDMA) and is used in various digital wireless telephony technologies. The data is digitized, compressed and sent through a channel (which may have other users) during its time slot. The frequency band is 900MHz or 1800MHz. As the GSM operators are globally agreed upon, they allow the users to use their same mobile phone in different countries by changing the SIM card [3].

H. GPS (GLOBAL POSITIONING SYSTEM)

The boarding and de-boarding location of the students are identified using GPS technology. The GPS coordinates are captured and the GSM modem sends it to the parent and the authorities. GPS is a satellite navigation system which gathers accurate information regarding to the location and time. If there is no obstruction of sight between three or more GPS satellites on or near the Earth, the location can be accurately determined. 24 satellites are currently active in the GPS navigation system. Along with these satellites and ground stations, the GPS receiver calculates the location of the students [3].

IV. HARDWARE IMPLEMENTATION

Fig.5 shows the hardware implementation of the bus unit. Here GPS, GSM modules and RFID Reader and sensors are interfaced to the ARDUINO board. Accelerated tilt sensor and gas sensor detects the tilting of the bus and entering gases into the bus respectively and sends this information to the arduino board. This arduino board process this received information from the inputs and gives necessary instructions to output that are GSM Module and LCD Display.



Fig 5. Hardware Connections.



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But in this fig.5 LCD Display is not yet interfaced to the arduino board. But the RFID part is completed. So, Whenever the Tag is placed near the Reader a beep sound is heard simultaneously a green LED will glow. This indicates that the information from the tag is received by the reader. Then a message will be issued to parents conveying that your child entered safely into the bus, your child departed safely from the bus.

V. RESULTS

These are some of the results that are obtained, whenever child board and leave the bus and also conveying about the accidents like fire by observing the changes in the temperature sensor.

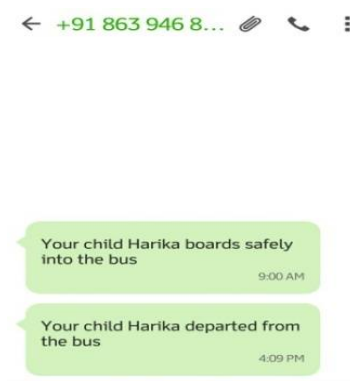


Fig 6. Alert Messages.

The fig.6 shows the result of issuing the message alert when the children boards and departed from the bus in which the present situation is mentioned and message is issued by the GSM modem. Whenever the child brings his RFID Tag near to the RFID Reader then the information of tag is read by the reader and this is conveyed to arduino board. This arduino board sends some instruction to GSM Modem, according to that an alert message will be issued to authorized persons and school authorities.

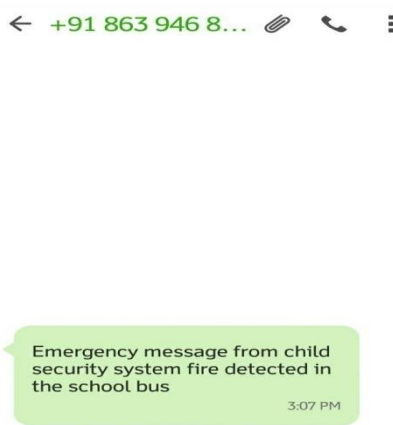


Fig 7. Message from GSM Modem.

The fig.7 shows the result, when fire is detected in the bus with immediate action it is detected by the temperature sensor, and a message will be issued by the GSM modem, which is present in the given figure below. The temperature sensor is useful to sense the changes in the temperature and gives the information to arduino board, from this information will be conveyed to authorized persons through GSM Modem.

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Likewise, all sensors can sense the information and accordingly alert messages along with location will be conveyed to the school authorities and parents with the help of GPS and GSM Modules.

VI. SYSTEM OVERVIEW

Below figure gives clear idea about this system. Whenever the child brings the RFID tag near to the RFID reader. RFID reader will interface to ARDUINO UNO board and it transmits the alert messages saying that your child safely reached the bus.

When the bus met with accidents like fire accident, road accidents or any gases entered into the bus. This system provides sensors to detect these type of accidents. These sensors are interfaced to ATMEGA328 processor, this processor issues a command to GSM modem to convey the information through message to the authorized persons (parents of the child who are in the bus). Along with the message it sends the latitude and longitude position of the bus to detect where the bus is. This can be achieved by using GPS module.

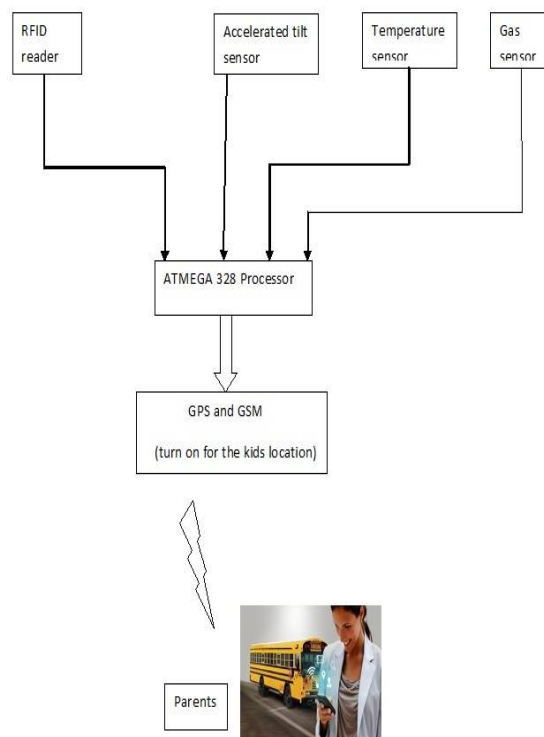


Fig 8. System Overview.



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VII. CONCLUSION

This paper presents a RFID based system that enhances the safety of the children during the daily trip from and to school. GSM module issues messages to parents whenever the child boards and leaves the bus. Sensors in this system senses the accidents like fire and road accidents and the total information will be convey to authorized person in the form of message using GSM module. Location of the bus will also be detected and convey to parents with help of GPS module. Future work includes interfacing the GPS Module to the BUS UNIT. Once this interfacing can be completed, this system can be capable of tracing the location of the bus helping to safeguard the lives of the school children.

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