RFID-based System for School Children Transportation Safety Enhancement

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Abstract- Millions of children need to commute between homes to school every day. Safer transportation of school children has been a critical issue as it is often observed that, kids find themselves locked in the school bus at the bus stop after going to school, they miss the bus, or ride the wrong bus with no way to track them. This project intends to find yet another solution to solve this problem by developing a bus safety system that will control the entry and exit of students from the buses through an energy efficient methodology. The proposed system will control the entry and exit of students to and from the bus using RFID (Radio Frequency Identification) and GSM technologies to ensure the entering and exiting of all students to and from the school bus in a safer manner. The process does not require any additional action by the student and drivers. The system will do all the process and allow the student to be tracked while entering and leaving the bus and If all the students were wearing seat belts mean, it will allow bus driver to start the bus for safety precaution. If the bus journey is successful from the source to destination, it will send an SMS to the management to inform its departure and arrival.

Keywords – Bus Safety System, RFID (Radio Frequency Identification), GSM modem.

I. INTRODUCTION

School buses transfer millions of children daily in various countries around the world. While there many issues that might disturb the parents regarding the travel safety of school going children, the paper intends to look into introducing access safety in respect of school buses through bus tracking system that will help the school children's transportation in a secure and safer way. The supervision of the regularity of students during their entry and exit from the bus is difficult to be controlled by drivers, which led to endangering child safety.which has increased significantly in recent years.

This has often led to the death of many students on account of suffocation due to the lack of attention of derivers. This project, through entry and exit recordings, aims to create a suitable environment by following certain set of criteria of security and safety for school bus that will have a positive impact on the student and their family.

The paper proposed a bus safety system which was designed to control the entering/exiting of students from the bus. This system does several tasks, including identifying personal information (Eg. Name) of each student using RFID tag, which will exchange the data with the RFID reader via radio waves and displaying each student name into LCD display. This will let the driver to know the number of students inside the bus and the students who departed from the bus. Moreover, the system has an emergency system that will alert in case if there is a child inside the bus after the bus stops at the destination by sending an SMS to the school management via GSM modem. In addition, if the bus depart and arrive successful from the source to destination, it will inform the management through an SMS about its successful departure and arrival. The key novel feature of the proposed methodology is the use of energy efficient systems to support the tasks. Though not within strictly in the scope, the same data can be used to assess the time of departure and arrival, number of students travels each day

II. PROPOSED SYSTEM FRAME WORK

The system block diagram of the proposed system is shown in the following figure (Figure 1). The major steps involved in the system development are explained the render
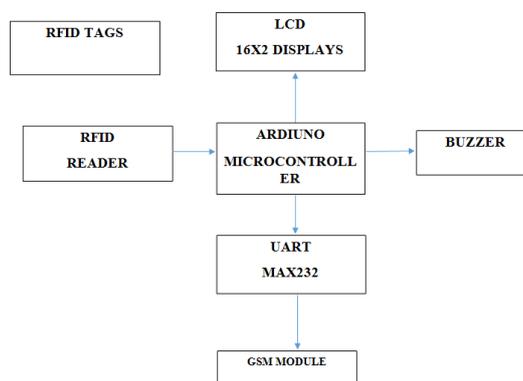
RFID Reader

The function of the RFID reader is integrated with RFID tags. It contains the reader module, which works as both the transmitter and receiver of radio frequency signals. The transmitter consists of an oscillator to create a carrier frequency, a modulator that impacts on data commands, and amplifier to enhance the signal enough to awaken the signal. On the other side, the receiver has a demodulator to extract the restored data and it contains an amplifier to strengthen the processed signal. The microcontroller forms a control unit that stores data and then sends it to the network. They have three series set ID3, ID12, and ID20 and these all are LA series. The experiment uses ID20LA innovation as it is the biggest kind of ID. It can be read any RFID card within range, and any microcontroller can easily read it.

GSM Module

SIM900 GSM modem is used in this implementation as it allows sending SMS to the management of the school via internet. This modem is a type of modem that accepts SIM card, and operates through a subscription to a mobile operator. It works like a mobile phone for sending and receiving SMS or MMS through radio waves. It is slim and compact, the main advantage of choosing this particular modem is, it has low power consumption. This modem has a GPRS feature that allows transmitting the data via the internet in different methods such as SMS, GPRS, or CSD.GSM modems connectivity was tested using TMAS GSM-GPRS modem test program with AT commands that are responsible for sending and receiving SMS calling.

16x2LCD

16x2 LCD as it is economical, and easily programmable. 16x2 LCD means that it is able to display 16 characters per line on two lines. This LCD has two resisters. Liquid Crystal Display (LCD) is an optical device consisting crystals arranged on a thin surface. LCD has certain features such as; its size is much less than the regular screen, light and easy to transport, does not need high voltage of electricity like in the regular screens, comfortable for the eyes compared to regular screen, their shape is much better than normal screen, and its quality is higher than normal screens in terms of colors.

RFID Tag (Card)

RFID tag stores unique digital identity codes that can be scanned from a distance and as well as to capture the signals and send them to the reader. RFID comes in different forms such as a label card, which can have a barcode printed on it. RFID tags are used in many industries, where it can be used to track gby suspending it in the automobile during production or it can be injected into animals that allow identifying the animals. In addition, it can be attached to clothing or even implanted in people to determine the identity of the person. RFID tags can be active, passive, or semi-passive. The experiment has used a 40 bit unique ID, it cannot be reprogrammed, blank, flexible, and white in color. RFID tag has two types active tag and passive tag. But in this project using passive tag because it is shortly reading. then active tag are contain an internal battery do not require power from reader. Passive contain internal battery and thus depends RFID reader for operating power and certainly have a low power range limited upto few meters.

Microcontroller Ardiuno

ADIUNO microcontrollers used to interface the Reader and the GSM modem in the bus for data exchanging. The reader with microcontroller using serial communication interfaceRS232. The difference voltage level a max232 chip is used to convert the signals from RS232 serial port to signal suitable f or TTL compatible digital logic circuits the figure of ardiuno microcontroller is given by.
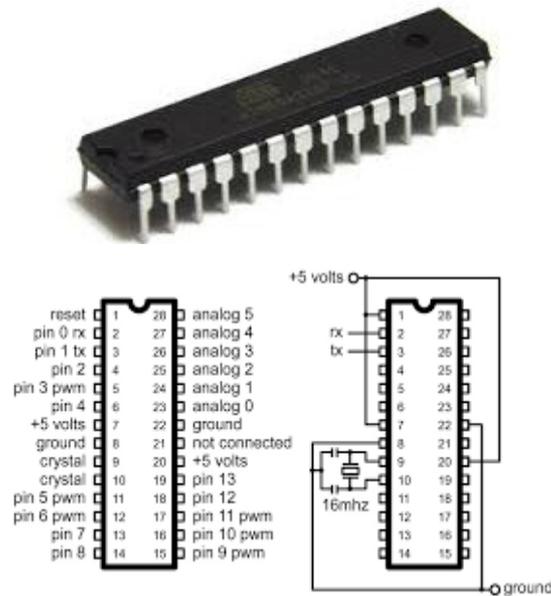
AT Commands

AT Commands are a specific command language used to control modems to do their specified functions. The command set consists of a series of short text strings which are combined together to produce complete commands for operations such as dialing, hanging up, sending messages and changing the parameters of the connection. As for the proposed project, a set of commands are required to establish a connection between the mobile operator and the GSM modem. All used commands are explained in the table.

This flow chart explains the operation of the system. The system starts once the students scan their card into the RFID reader. The RFID reader will sense the medium, if it captured any data from the RFID tag (card), the system will show the data into LCD display. If it is not, the RFID reader will re-sense the medium to read the next tag. After the bus stopped, the driver makes sure if there are still students inside the bus by scanning his card. If there are still students on the bus, the LCD will display the reminders students and the GSM will send an SMS message to the school management. If there are not, the LCD will show, there is nobody on the busAT Commands are a specific command language used to control modems to do their specified functions. The command set consists of a series of short text strings which are combined together to produce complete commands for operations such as dialing, hanging up, sending messages and changing the parameters of the connection. As for the proposed project, a set of commands are required to establish a connection between the mobile operator and the GSM modems.
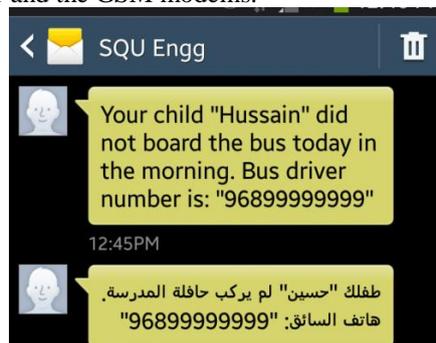

System Working Principle

The working principle of the bus safety system is that since each student carries a card that contains a unique number with his/her name, so once the students start entering the bus, the RFID reader will capture their names and display them into a screen placed in front of the driver. Then after the bus stopped and students got off from the bus, the driver will scan his card to make sure, if there are still students inside the bus. If there are, the system will display their names into the screen and then it will send SMS to the school management to take the right decision. The system will also send the message to the management to inform them the safe departure and arrival of the bus to the destination

III. IMPLEMENTATION

Software Implementation

System circuit has designed by using the ISIS 7 Professional (Proteus) program with all required components and the simulation has carried out. Since the GSM modem and the RFID reader could not be simulated by the Proteus, an actual GSM modem and RFID reader have physically connected to the computer through a serial port to facilitate the communication between the Proteus program and the external devices to implement the simulation. While the LCD has stimulated by the program successfully to display the system operation as showed in the Figure 3.

After the simulation has made, the PCB layout of the system has designed and constructed into the breadboard.
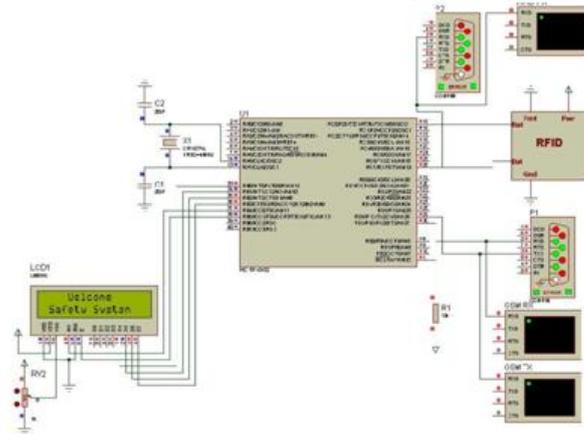
Hardware Implementation

System circuit has designed by using the ISIS 7 Professional (Proteus) program with all required components and the simulation has carried out. Since the GSM modem and the RFID reader could not be simulated by the Proteus, an actual GSM modem and RFID reader have physically connected to the computer through a serial port to facilitate the communication between the Proteus program and the external devices to implement the simulation. While the LCD has stimulated by the program successfully to display the system operation as showed in the Figure 4.

After the simulation has made, the PCB layout of the system has designed and constructed into the breadboard.

After carrying out the system simulation, designing the PCB using Proteus program, printing it into the PCB, and testing was carried out. All components have collected and connected to the PCB as shown in Figure 4. Then, the implementation of the system was tested and the prototype has designed as shown in the figure 5.

Once the card of students scanned via the RFID reader, the data of each student (Name, ID) displays in the LCD. For example, as shown in the Figure 6, once the students entered into the school bus, the LCD displayed that the students have entered to the bus with their information. This helps the driver to know the existing students on the bus.


After that, the driver will make sure if there are still students inside the bus by scanning his card via RFID reader. If there are still students, the LCD displays their names and then the system will send an SMS message to the School management as shown in the Figure7 to take the right decision.

IV.   RESULTS

The system implementation was tested and it found that the system has worked as expected. Firstly the system was simulated in the Proteus software. Then, the system was programmed by Mikrobasic software and tested in Easy
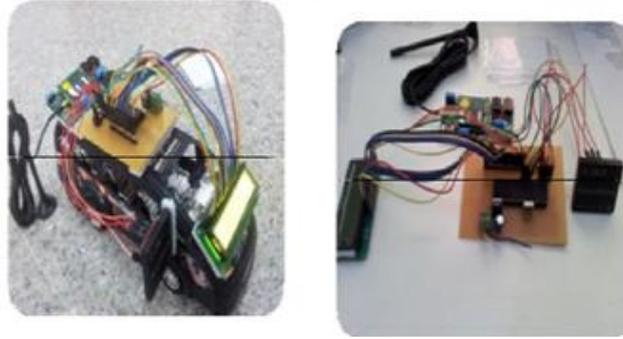
PIC7 development board. After the simulation of the system was tested, a toy bus was used to test the system. The RFID reader is fixed on the bus door. The RFID reader has tested by entering the tags (cards) in the bus through it. While the GSM has tested by connecting the GSM modem to a PC directly through the USB cable. Then the GSM has tested by using AT command tester program. example, if AT is written and the reply For was 'ok', this was meant that the communication with the GSM modem worked fine. Some other basic AT commands have checked and tested to make sure that the GSM modem is working successfully. In addition, the LCD was fixed in front of the bus and it has tested to perform the operation of the system.

V.   CONCLUSION

The integration of RFID and GSM technologies for safety and security purpose is very important nowadays due to increase in accidents of children gets missed out at the bus which may lead to death due to suffocation. In this project, bus safety system for school children has been developed. Using this system, concerned authorities, bus driver can be alerted as it's visible from the RFID card. At the same time, in case if there was a student on the bus, the system will send an SMS message to the management of the school to take the right decision. The paper shows that that RFID technology based tracker system is still acts as one of the best solution to enhance the safety in the school buses, which will reduce the accidents of forgetting the students inside the bus. If all the students were wearing seat belts mean , it will allow bus driver to start the bus for safety precaution.

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