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Embedded Based School Children Safety Enhancement Using RFID

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ABSTRACT: A lot of children need to commute between homes to school every day. In recent days safer transportation of school children has been a critical issue as it is often observed that, the child is forgotten in the bus and also find that the bus being diverted from actual route. This project intends to find yet another solution to solve these problems by developing a bus safety system that will control the entry and exit of students from the buses through an advanced methodology. The proposed system uses RFID (Radio Frequency Identification), GPS technology to track the current position of the bus, GSM to send notification to parents regarding student and an ultrasonic sensor with buzzer to create special attention to drivers to avoid accidents.

KEYWORDS: Microcontroller, GSM, GPS, Ultrasonic sensor, Buzzer,RFID, Student safety.

I. INTRODUCTION

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

This system does several tasks, including identifying personal information (E.g. 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.

II. RELATED WORK

In [1] system uses the autonomous clustering technique to monitor the children in group and when separated. Each child is provided with an android mobile with them. A group of students are indicated as G. When this group G comes near to the tag T, it collects the group ID and sends to the server through mesh network. It uses Bluetooth to send the information which is one to one. If communication between neighbouring mobile is interfered then collision occurs. In [2] system deals with tracking children using android mobiles. It uses ARM7 processor with GSM, GPS and voice play back unit. The ARM7 triggers voice play back unit when the child cries. If the voice is matched it sends the alert message to their respective parents. Parents can also view the child location in the android mobiles through google maps. Special application called eclipse is created in the mobile which can create new applications (SMSMAP).[3] Provides safety to the students in the bus stops using Intelligent Transportation System Telecommunication Technology (ITST).Here the Intelligent Bus Stop (IBS) detects the RFID tags of the students and indicates the student's presence in bus stop to the passing vehicles by a sign board with a flash light. It also indicates the cars by showingH symbol in the GPS.[4] System will handle, safe route planning, rerouting of routes, school bus position tracking, safety enhancement applications for drivers, warnings for surrounding vehicles and training schemes for school bus drivers. The average speed of cars was significantly reduced by the flashing bus stops. The evaluation will focus on usefulness, effectiveness, acceptance in a user perspective.

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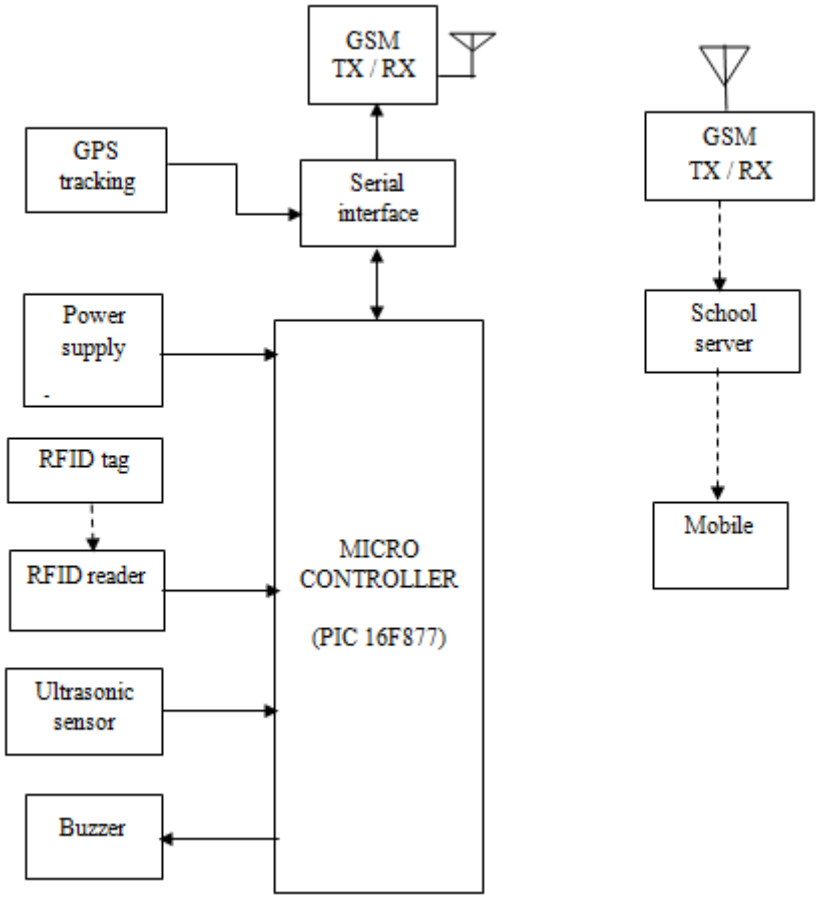
III. BLOCK DIAGRAM

The main objective of the project is to increase the safety of the school children during transportation.This system uses various components like

1. Microcontroller
2. RFID tag and reader
3. Ultrasonic sensor
4. Buzzer
5. GSM
6. GPS



HARDWARE REQUIREMENTS

A. MICROCONTROLLER

The term PIC stands for Peripheral Interface Controller. IC 16F877 is a 40-pin 8-Bit CMOS FLASH Microcontroller.

Overview and Features:The PIC 16F877 Microcontrollers are basically RISC microcontrollers with very smallinstruction set of only 35 instructions and a two-stage pipeline concept fetch and execution of instructions. As a result, all instructions execute in a single cycle except for program branches.

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Fig 1 PIC microcontroller (PIC 16F877)

Here the microcontroller reads the information from the RFID reader and leads the GSM to send the data to server and it triggers the ultrasonic sensor to calculate the distance between the bus and the student.

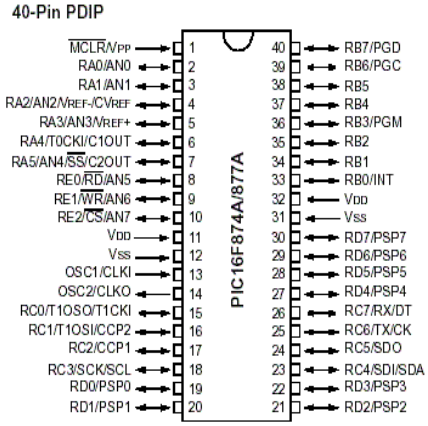

Fig 2 Pin diagram of micro controller

B. 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 radiofrequency 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.

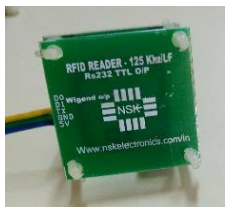

Fig 3.a RFID tag Fig 3.b RFID reader

The microcontroller forms a control unit that stores data and then sends it to the network. It can read any RFID card within range, and any microcontroller can easily read it.RFID tag scanned from a distance and as well as to capture the signals and send them to the reader, thus it detects each and every tag and sends the data to the server. RFID comes in different forms such as a label card, which can have a barcode Printed on it. The experiment has used a 40 bitUnique ID; it cannot be reprogrammed, blank, flexible, and white in colour.

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C. GSM MODEM

SIM800C 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, and it has low power consumption. Here the GSM is mainly used to send text messages the child details to the parents and the server.

Fig 4 GSM 800C

D. ULTRASONIC SENSOR

Ultrasonic sensors are transducers that convert ultrasound waves to electrical or vice versa. Those that both transmit and receive may also be called **ultrasound transceivers**; many **ultrasound sensors** besides being sensors they can indeed act as transceivers because they can both sense and transmit.

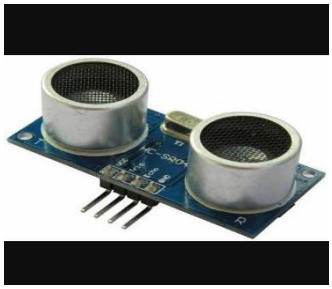

Fig 5 Ultrasonic sensor

In this system once the sensor is triggered, it emits the ultra sounds which echoes back after striking the obstacle. It then determines the distance between the bus and the child by calculating the time taken to send and receive the sounds waves.

E. BUZZER

It is an audio signalling device. It can be mechanical, electro mechanical or piezoelectric. The electro mechanical buzzer is used in this system to give special attention to the drivers when to start the bus.

Fig 6 Buzzer

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F. GLOBAL POSITIONING SYSTEM DEVICE

The Global Positioning System based satellite navigation system that provides location and time information in all weather conditions. Positioning system basically consists of Transmitter and Receiver. The transmitter's job is to track the location with the help of information from satellite based on longitude and latitude position. Working of GPS is explained as follows, the GPS transmitter sends the signal to the satellite through which satellite reads the current position of the bus and sends to the GPS receiver, using GSM the current latitude and longitude of the bus is sent to the school server.

Fig 7 GPS

SOFTWARE REQUIREMENTS

1. CCS COMPILER

The PCB, PCM, and PCH are separate compilers. PCB is for 12-bit opcodes, PCM is for 14-bit opcodes, and PCH is for 16-bit opcode PIC® micro controllers. These compilers are specifically designed to meet the unique needs of the PIC® micro controller. This allows developers to quickly design applications software in a more readable, high-level language. IDE Compilers (PCW, PCWH and PCWHD) have the exclusive C Aware integrated development environment for compiling, analysing and debugging in real-time. When compared to a more traditional C compiler, PCB, PCM, and PCH have some limitations. As an example of the limitations, function recursion is not allowed. This is due to the fact that the PIC® has no stack to push variables onto, and also because of the way the compilers optimize the code.

2. ISP

For most Microchip micro controllers, ISPProgramming is performed using two pins, clock (PGC) and data (PGD), while a high voltage (12 V) is present on the Vpp /MCLR pin. Low voltage programming (5 V or 3.3 V) dispenses with the high voltage, but reserves exclusive use of an I/O pin. A separate piece of hardware, called a programmer is required to connect to an I/O port of a PC on one side and to the PIC on the other side.The data is transferred using a two wire synchronous serial scheme, three more wires provide programming and chip power. The clock signal is always controlled by the programmer.

IV. SIMULATION AND RESULT

The fig 8 given below shows the entire setup of the system that includes microcontroller, RFID, GSM, GPS, ultrasonic sensor and buzzer. Where the laptop is considered as the school server.

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Fig 8 Setupwith laptop as server

OUTPUT AT THE SERVER

Fig 9 shows the messages received by the server from the GSM of the bus unit. Messages includes student boarding the bus, latitude and longitude of the bus currentposition.

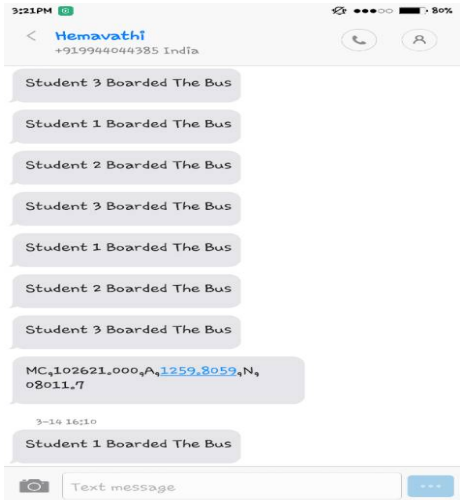

Fig 9 message received by the server

OUTPUT AT PARENT MOBILE

The below given Fig 10 shows the text received by parent's regarding child reaching the destinations safely that is to and fro the school.

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Fig 10 message received by the parents

V. CONCLUSION AND FUTURE ENHANCEMENT

Thus this system ensures child safetyby using RFID to detect the children while boarding the bus, updates the attendance during daily trip to and from the school by sending SMS to parent and school server using GSM. It also uses ultrasonic sensor to detect any obstacle and givesspecial intimation to driver through buzzer,if no obstacles are present and thus avoids accidents and provides safer transportation. GPS stipulates the current location of the bus and send the message to the school server.

This system can be further implemented using active RFID which can be detected easily by the RFID reader within a minimum range and to improve driver's attention an Omni directional antenna can be used to detect the presence of the students in all directions. Further in case if the driver attends phone calls during the motion of the bus an alert notification to the server can be provided.

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