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RFID- GSM- GPS Imparted School Bus Transportation Management System

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Abstract: *Children Safety is the topmost concern and priority of parents these days regarding their children. In present time parents worry about their children due to increase in number of kidnapping and road accident cases. The safety mechanism for the children travelling from home to the school and back to home during the daily bus transportation is a crucial part to the parents and to the school management. This proposed system mainly ensures the overall safety of school children and to monitor pick-up/drop-off of school children during the daily bus transportation from and to school. The bus unit is used to detect when a child boards/ leaves the bus and this information is sent to controller and an alert message is issued accordingly.*

Keywords: *RFID, GSM modem, GPS module, MEMS Accelerometer.*

1. INTRODUCTION

Children Safety is the topmost concern and priority of parents these days. Children are our most important resource, but they lack skills to protect themselves. So it is the responsibility of parents/teachers and as a person, to safeguard and to teach them the skills to be safe. Now a day's most of the parents are working due to which they are not to pick up/drop off their children daily to/from the school. Today, most of students are travelling to school by school buses or school vans. Parents think that their children are safe if they travel by school bus. There are many common problems such as school bus getting delayed in traffic, school bus accident. To improve transportation safety, some schools employ bus supervisor's to take care of the children inside the bus. This paper presents a system to enhance the overall safety of children during daily bus transportation to/from school by monitoring the daily bus pick-up/drop-off of children to/from school. This system provides the best solution in reducing the parent work load and shows the current location of the bus. The system mainly aims at automatically detecting a child when he/she boards or leaves the bus and issues an alert message accordingly.

2. RELATED WORKS

There are many works done using Radio Frequency identification (RFID), it transmits the identity of an object using radio waves. One of the work done by K.Vidyasagar and G.Balaji [1] proposed a system which uses RFID Technology and GSM Technology and ARM 7 microcontroller .This system provides the status of the student and is made available to the school principal and with the parent time to time. The information of the children is secured by providing the message to the parent along with the obstacle detection in daily bus transportation. Another work done by Ali-al Maharuqi and Dr. Jayavrinda Vrindavanam [2] proposed a system which uses RFID Technology and GSM Technology and PIC microcontroller .This system provides the entry and exit of the school children in transportation. Another work done by Anwaar Al-Lawati presented an RFID-based system that aims at enhancing the safety of children in the daily bus trip to and from the school. RFID-based system includes a detection unit which is located inside the bus detects the RFID tags worn by the children's. The system sends data to the system database server, via a GSM modem. The system detects if a child did not board the bus and issues an alert message. In addition; the system also checks the children attendance and updates the database. The parents can log on into system website and monitor the details of their children.

3. PROPOSED METHODOLOGY

The system proposed mainly aims at monitoring the school children during the daily transportation to/from the school. For implementing this system we have used Radio Frequency Identification (RFID), Global System for Mobile Communication (GSM), Global Positioning System (GPS), and Micro Electro Mechanical System (MEMS) based Accelerometer and ARM CORTEX M-3 Microcontroller. RFID technology locates the child position GSM will pass information about the child to his or her parents. The system mainly consists of bus unit. The bus unit is used to detect when a child enters the bus. Child's information at entry/exit level is recorded automatically when they pass nearby the reader. At the same time parents will automatically receive the SMS from the system that inform their child boards/leaves to/from bus. In case if an accident is occurred, an SMS is sent to the school administration. The system will send SMS to the parents informing the location and the time at which the child has boarded the school bus. This system will be beneficial to the parents, school children's and school administrator. This system proposed will be promising to enhance the overall safety of the children during daily bus transportation.

3.1. Block Diagram

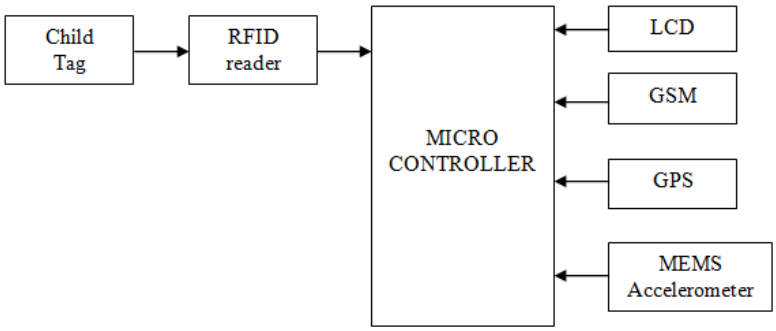

Figure1. *Block Diagram*

3.1.1. ARM Controller

The microcontroller does all the operations; it sends data to GSM module and LCD display. It handles both input and outputs. The Cortex-M3 is a 32-bit microprocessor with 32-bit data path, a 32-bit register bank, and 32-bit memory interfaces. The LPC1768 is a ARM Cortex-M3 based microcontroller for embedded applications featuring a high level of integration and low power consumption. The main features of the LPC1768 controller are:

- 512 kB of flash memory , 64 kB of data memory
- Single 3.3 V power supply (2.4 V to 3.6 V) , Non-maskable Interrupt (NMI) input
- Built-in Nested Vectored Interrupt Controller (NVIC)
- Brown-out detection with separate threshold for interrupt

3.1.2. Power supply

Regulated power supply is an electronic circuit that is designed to provide a constant DC voltage of predetermined value across load terminals irrespective of AC mains fluctuations or load variations.

The two main parts of a regulated power supply are a simple power supply and a voltage regulating device. The power supply output is given as input to the voltage regulating device that provides the final output. The voltage output of the power supply remains constant irrespective of large variations in the input AC voltage or output load current.

3.1.3. RFID Module

Radio Frequency Identification Technology is the fastest growing automatic data collection (ADC) technologies and is a wireless communication that uses radio waves to identify objects or people. It comprises of one or more reader and RF tags/transponders through which data transfer is achieved using electromagnetic waves. The EM-18 RFID Reader has an inbuilt antenna coil .When power is applied; the reader generates electromagnetic field which is induced by the antenna present inside the tag.

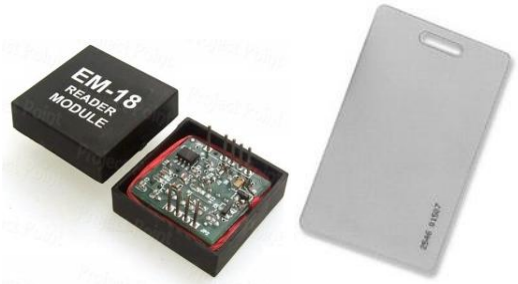

Figure2. *RFID Module*

3.1.4. GSM Modem

GSM module sends data via SMS to users (Parents/School Authorities). Global System for Mobile Communication (GSM) can be used to send and receive SMS or make/receive voice calls. GSM Modem is built with Dual Band GSM/GPRS engine.SIM900A, works on frequencies 900/ 1800 MHz. The baud rate can be configurable from 9600-115200 through Attention (AT) command. The GSM/GPRS Modem is having an internal TCP/IP stack which enables to connect it to the internet via GPRS. GSM module sends data via SMS to users. It establishes serial communication with the microcontroller. The Transmitter and Receiver pins of GSM modem are connected to the UART of the microcontroller.

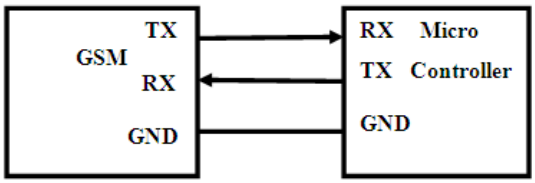

Figure3. *Serial Communication between GSM modem and Microcontroller*

3.1.5. GPS

Global Positioning System finds the location co-ordinates of the children where he/she boarded the bus and sends the data to the microcontroller. The GPS-634R is a smart GPS module integrated with a ceramic GPS patch antenna connected via an LNA (Low Noise Amplifier).The module consists of 51 channel acquisition engine and 14 channel track engine, which are capable of receiving signals from 65 GPS satellites .The precise information is transferred and can be read through UART port or RS232 serial port. It is provided with an interface connector for both the LVTTL-level and RS232 signal interface with supply voltage is 3.6 - 6v DC. It supports the National Marine Electronics Association's (NMEA) 0183 protocol, as do many GPS modules. GPS module continuously sends the data to the microcontroller**.** The transmitter of GPS-634r is connected to the receiver of microcontroller. It establishes serial communication with the microcontroller.

3.1.6. MEMS Accelerometer

An accelerometer is an electro-mechanical device used for measuring the acceleration of a moving or vibrating body. The MMA7660FC is a 3-Axis digital output accelerometer and can be used for sensor data changes product orientation and gesture detection through and interrupt (INT). This accelerometer features programmable functions such as orientation, tap, and shake detection that provides embedded intelligence. It is a low profile capacitive MEMS sensor featuring a low pass filter with reduced power consumption, and it provides conversion to digital values at user configurable samples per second.

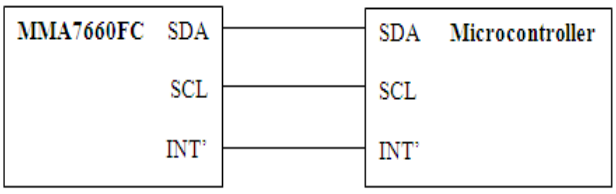

Figure4. *I2C Communication between MEMS Accelerometer and Microcontroller*

MEMS Accelerometer will detect and send information to the controller, if an accident occurs. It establishes I2C Communication to the controller i.e. the data line and clock line is connected to the microcontroller

4. RESULT

Figure 5 given below shows the entire setup of the system that includes microcontroller, RFID module, GSM modem, GPS module and MEMS Accelerometer

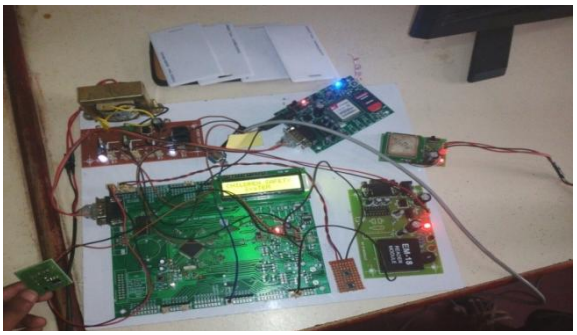

Figure5.*Overall Setup of the System*

The following figure 6 show the messages received by the parents and the school from the GSM of the bus unit. Messages include student boarding the bus, latitude and longitude of the bus current position and the time at which the child boarded the bus.

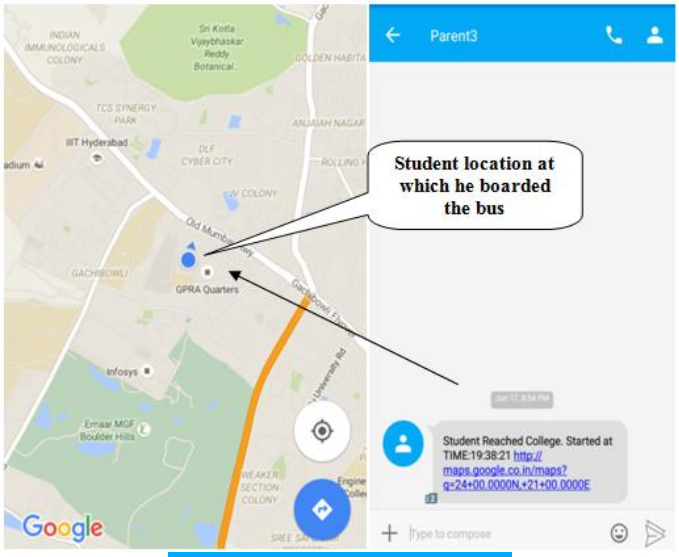

Figure6. *Messages received by Parents*

Figure 7 shows if an accident is occurred, a message will be sent to School authority along with the location at which the accident occurred.

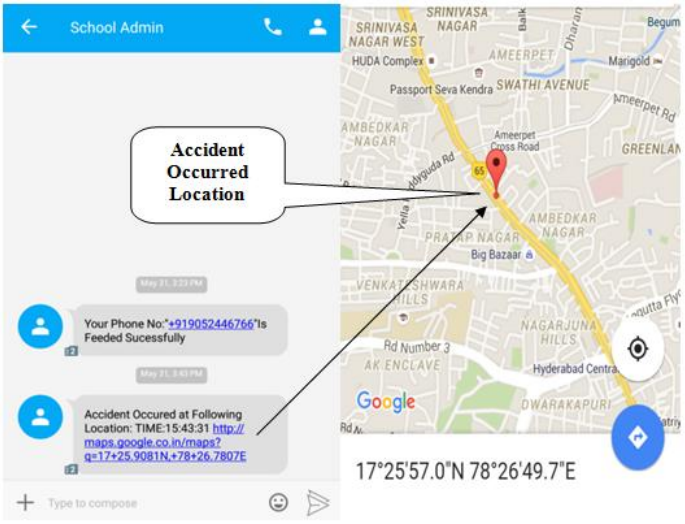

Figure7. *Location of Accident Occurred*

5. CONCLUSION

The system implemented to mainly ensures the safety of the children during daily transportation to/from the school. The system intimate parents and school authorities regarding the children i.e. the time and also the location of the student which is provided by the GPS Module, at which he/she boarded, via a GSM modem. The system detects which child did not board or leave the bus and issues an alert message accordingly. In addition, the system also detects if an accident occurs and a message is being issued. It is very important to ensure the safety of the children during the bus transportation and the system proposed to provide safety and secured information.

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