RESEARCH ARTICLE OPEN ACCESS

A SMART SCHOOL PUPIL'S TRANSPORT MONITORING SYSTEM

B. RAMESH[1], Dr.S.A.K. JILANI[2]

[1]Research scholar, Dept. of ECE, Madanapalle Institute of Technology & Science, Madanapalle, Chittoor Dist., A.P, India.

[2]Supervisor, Dept. of ECE,Madanapalle Institute of Technology & Science,Madanapalle, Chittoor Dist., A.P, India.

Abstract:

In the present world, there are different technological methods available in order to provide safety and security for school children in the process of transportation to and from school. But these methods and hardware used are costlier and consume more power. At the same time, they are static and not real time operable.Security concerned activities always demand high cost human resourcesand manual operations.

In order to overcome the above disadvantages,the proposed model is designed with the embedded systemusing ARM7 TDMI processor. The model uses different modules such as Micro controller LPC2148, RFID reader, RFID tags, GSM modem, 16X2 LCD.

This paper presents anautomated system to monitor the schoolchildren who are using school transportation for attending school. The system consists of two modules such as Busmodule, parent module and school module. The Bus modulein this system is used to identify the pupil every time when he or she board or alight the school bus with the help of RFIDtag, which is, placed in identity card. This information is communicated to the parent mobile along with time stamp by using SMS. Daily Student attendance at various pick-up points is recorded and updated in onboard module and also in school module. The parent and school modules may be a simple mobile phone, which receives SMS alerts from the Bus module.

Microcontroller LPC2148 is the heart of the project. It reads student ID numbers from ID cards by using the RFID reader interfaced to it. The GSM modem is also interfaced to the microcontroller, which sends the alert messages to the parent mobile phones.Keil IDE is used to develop the source code of the project.Flash magic software is used to load the generated object file into the microcontroller IC. Proteus simulator softwareis used to simulate the entire project before working on hardware.

Keywords — **Student Transport monitoring, ARM7, TDMI, GSM module, RFID reader, RFID tags, Keil IDE, Proteus.**

1. INTRODUCTION

According to National Crime Records Bureau, India, the number of crimes reported against children in 2016 are doubled, of which over 37,000 involved kidnap and abduction and nearly 14,000 involved rape. School children safety and security is of most important concern to their parents and schools. Eventhough many safety and security measures are implementedby school administration, in order to protect them, they may end up in a troublesome situation (e.g. crossing the road without paying attention to traffic)[1]vulnerable to abduction and kidnap Etc.

Parents escorting their children to school may be the best option to insure safety and security, but all parents may not afford it. The next option may be using school transportation where monitoring is done by human resources. Because of operational cost school management often,hire unskilled andinadequate man power, whichmay invite unwanted situations and oversight of the human or supervisor absence may lead to catastrophe. This paper focuses on the automated school children security and safety system which supplements the manual monitoring of the school children when boarding/leaving the bus.

This projectconsists of a system thatcontinually monitor and record the daily bus pick-up/drop-off of children at various stages, and help to improve the overall safety and security of the daily bus transportation to/from school. The project motto is to automatically find out whether the child has boarded or left the bus at predefined timings[2]. Anyanomalous situation is immediately reported to the parent and to the school by sending the alert messages.

2. COMPONENTS USED

2.1 Microcontroller ARM7TDMI:

This part forms the control and monitoring unit of the entire project. It comprises of a microcontroller with supporting components like reset switch, quartz crystal

oscillator, pull up resistors etc. The controller communicates with other devices in order to work ascomplete system. The wireless devices like RFID reader and GSM are interfaced to the microcontroller by using serial communication protocols.

ARM stands for Advance RISC machine with RISC architecture. The project is implemented using LPC2148, it is one of the ARM controllers which uses low power(+3.3V, 800mA) and has sufficient memory(512K Flash and 32K Data) to handle small projects.

This module is heart of the project shown in Fig1, which reads student information from RFID reader when card is swiped and take necessary actions like authentication of student, timingcomparison and sending alert messages to other modules[3]. It also sends commands to LCD to display appropriate messages.

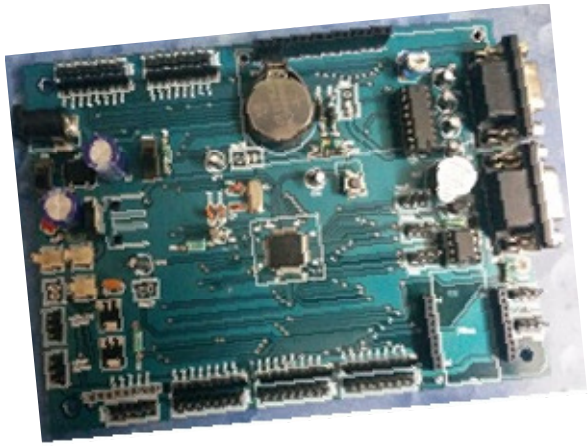

Fig1: ARM7 LPC2148 board

2.2 Liquid crystal display (LCD):

Alphanumeric LCD 16x2 JHD162A shown in Fig2 is used to display the event related data such as card number, student information andstatus of message sent to particular mobile.It can display 32 characters at a time, which is sufficient for this project to display status of the system.

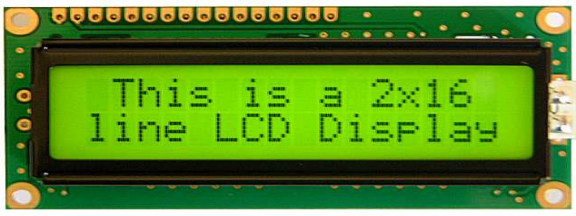

Fig2:16x2 LCD

2.3 GSM modem:

In this project, SIM900A shown in Fig3 is used for communication and is placed in student module to send alert messages to parent and School modules. This works on frequencies 900/ 1800 MHz and uses RS232 protocol tocommunicate with host system. This can be configured for baud rates from 9600 to 115200. It is interfaced to the microcontroller using serial port(UART0). Microcontroller uses AT commands to configure and send messages using this module.

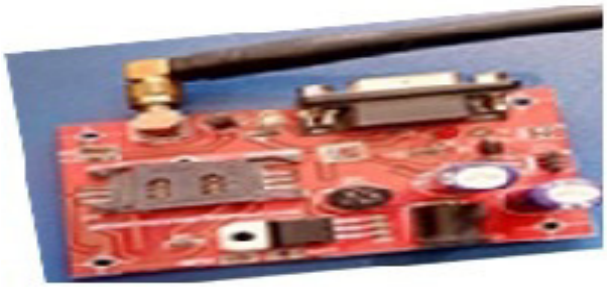

Fig3: GSM modem

2.4 RFID Reader:

EM-18 is a RFID reader module shown in Fig4, which reads unique 12-digit alpha numeric value from RFID tag embedded physically in the Student ID card.It operates at 125 KHz and can sense RFID-tag at the distance of 8 cm. The unique number read from the tag is sent to microcontroller via serial port(UART1).This module consists of LEDand Buzzer which gives visual and audio acknowledgment, whenever card is swiped.

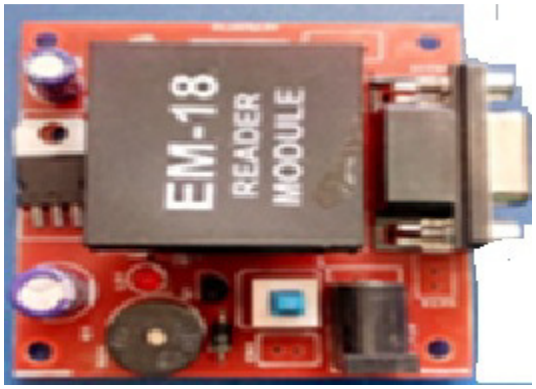

Fig4: RFID Reader

RFID tags:

In this project, passive **RFID tags** are used which do not have any built-in power supply and hence they have more operational life span. The power needed for RFID tags will be taken from reader whenever it comes near to the reader. The tags available in different sizes which can

be based on the application. The **passive RFID** is basically has three parts: Antenna which can capture energy and transferring the tag ID, Semiconductor IC appended to the antenna and an encapsulation which maintains the tag integrity [4]. The encapsulation protects the antenna and chip from harsh environmental conditions. The encapsulations made up of glass protected from plastic from top and bottom so that it can be easily adhesive to the goods.

As compared to active RFID tags passive RFID tags do not have the power source. Thus, the power in provided in two ways. The first one is magnetic induction method and second is electromagnetic wave transfer method by using the EM properties related with the RF antenna i.e. the near field and the far field [7]. Depending on the tag the power ranges from 10μW to 1mW. The operating frequency ranges of Passive tags are 128 KHz, 13.6 MHz, 915 MHz, or 2.45 GHz.

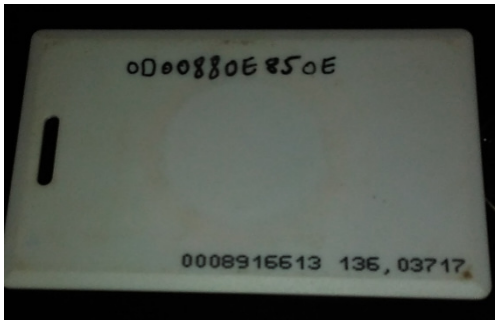

Fig 5: RFID tag

Fig5 shows the passive RFID tag. Whenever it is swiped near the reader the card takes power from RF signal of the reader and feeds it to the electronics inside the RFID tag which in turn transmits unique 12-digit alphanumeric data to the reader using RF signal.

3. PROPOSED SYSTEM

ARM7 TDMI LPC2148 microcontroller which has sufficient RAM, EEPROM and has thumb instruction set. These features enable to develop various applications with limited cost and low power. Almost 90% of the portable devices such as android phones use ARM controller as main module. The LCD Display is used to display the project related information such as title,scanned card number, message to particular mobile. The block diagram of the project is shown in theFig6.

Here GSM modem and RFID reader are interfaced to the LPC2148 microcontroller which has two UART ports UART0 and UART1. UART0 is connected to GSM modem using female to female DB9 cable in null modem connection. Similarly, UART1 is connected to RFID module using female to female DB9 cable in null modem connection. Each one operates at 9600 baud rates [5].

This system is placed near the door of the bus and students are supposed to swipe their ID card at the time of boarding and alighting the bus [8].

The flowchart of operation of system is shown in Fig7.

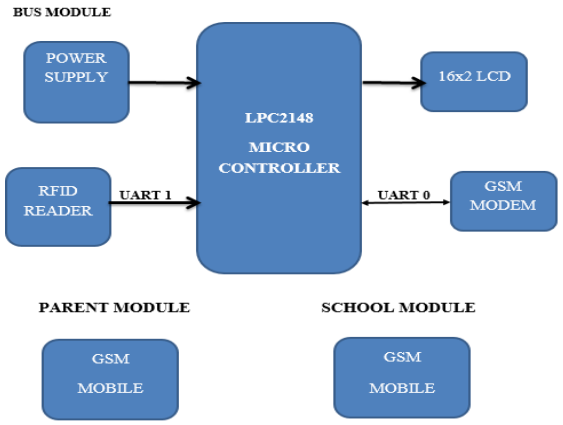

Fig 6: Block diagram of proposed system

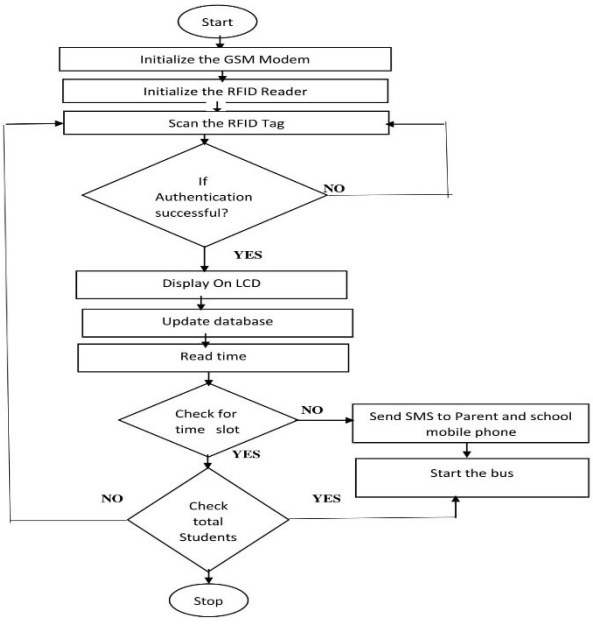

Fig 7: Flow chart

4. SIMULATION RESULTS:

Proteus Design Suite simulation software is used for electronic design automation before program is ported into microcontroller. After satisfactory simulation results

the hardware circuit is rigged and tested for its performance. Keil IDE is used to write the project source code using embedded C program. The snapshot of Keil IDE is shown in Fig8. After writing the code it is compiled in order to generate hex code for microcontroller [6]. The generated hex code is tested in Proteus simulator along interfaces, the snapshot is shown in Fig 9.

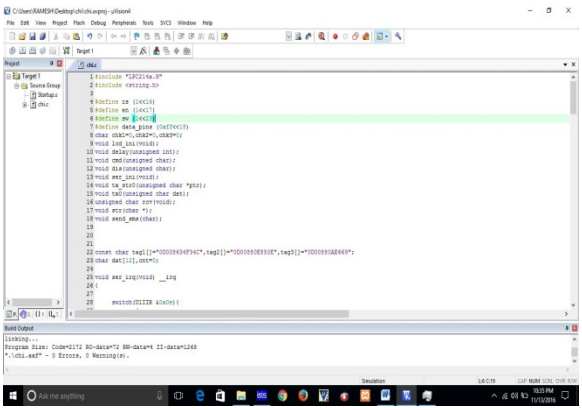

Fig 8: Keil IDE

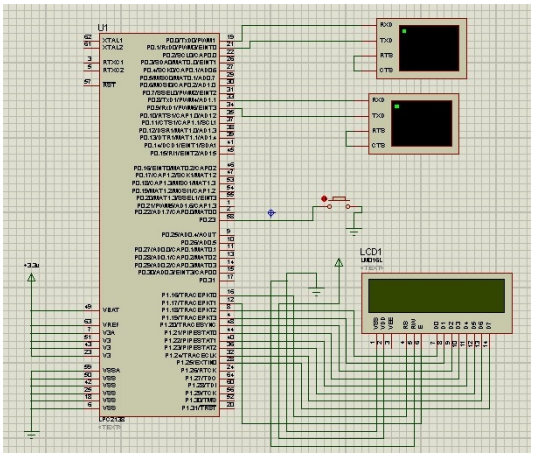

Fig 9: Proteus simulator

5. RESULT& DISCUSSIONS:

The prototype of school children security alert system using GSM, RFID and ARM7 which has Bus module andschool moduleandparent module the respective prototype images are shown below.

Fig 10: Bus unit with GSM and RF reader interfaces

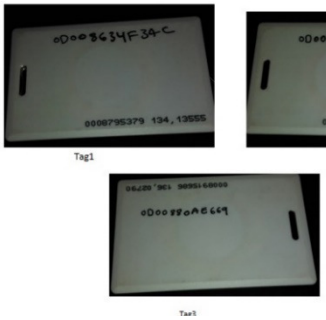

Fig 11: Sample Students RFID tags

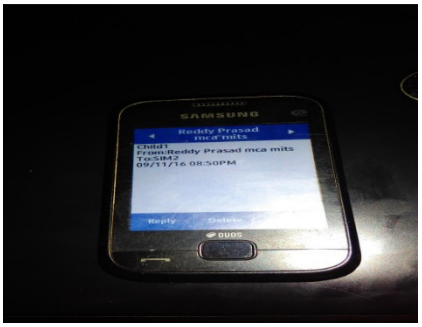

Fig 12. Parent and school module

The proposed system is tested with 100 trials in all possible conditions and found to accurate in all trials. The results are shown in the Fig 13

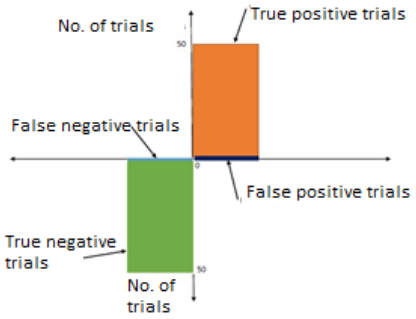

Fig 13: Graph showing trials of tags

6. CONCLUSION:

The integration of RFID and GSM technologies for school transportation may be one of the innovations which may ease the concerns of the parents regarding safety and security of their ward going school. This technology may avoid unwelcome situations like abduction and others. The work Bus safety system for school children has been developed using combination of proven technologies like RFID and GSM [9]. Using this system, Parents, concerned authorities and bus driver can be alerted to take necessary action in time.

7. ACKNOWLEDGEMENT:

I extended my sincere thanks to My Supervisor & Professor Dr.S.A.K.Jilani, ECE Department for his continuous support in materializing this project successfully.

8. REFERENCES:

[1] "4-year-old, forgotten in a school bus, dies". Available at:http://www.muscatdaily.com/Archive/Oman/4-year-old-forgotten-in-a-school-bus-dies [Accessed: 11 Aug. 2014]

[2] S. Shafaat, UAE launches smart school buses to improve student's safety system to offer parents direct access to bus status". 1 (2). section/education/2013-04-22-1.568158.

[3] Dr. S. A. K. Jilani,N. Rama Kumar,Ms. G. Nagaswetha ARM9 BASED DRIVING LICENSE VERIFICATION SYSTEM. International Journal of Advanced Research in Electronics and Communication Engineering, Volume 4 Issue 8 Pages-2111-2114.

[4]C. Kumar, "RFID based embedded system for vehicle tracking and prevention of road accident". International Journal of Engineering Research-, Vol.1, No. 6, pp3-5, 2012.

[5]Zonar, 2013. Zpass: Student Ridership Tracking. International research.4 (1), 20-25.

[6] Anon., 2011. Smart school bus monitoring and tracking system. IEEE Trans. Single processing, 55 (9), 200-205.

[7] Anon., 2012. School Bus Tracking – Student Tracker. Single processing. 3(1), 34-45.

[8] V Krishna Chaitanya Reddy, B Sukumar, SAK Jilani ARM 9 based finger print authentication system 2015/2 2nd National Conference on Recent Trends in Signal Processing.

[9] Dr.K.Malakondaiah Dr.S.A.K.Jilani, G.Satheesh Babu Interfacing of Matrix Keyboard with Microcontroller International Journal of Engineering Research and Development.2004/12 Pages 254-262.Volume 2 Issue 4 Pages 35-39.

AUTHORS DESCRIPTION:

First Author –Mr. B. RAMESHpursued his Master of Technology in the stream of Digital Electronics and Communication systems from Madanapalle Institute of Technology and Science, Madanapalle. He completed his B. Tech in the stream of Electronics and Communication Engineering from Madanapalle Institute of Technology and Science, Madanapalle. He attended 03 workshops and also 01 conference. His areas of interest are Embedded systems, Image processing, signal processing.
Email address: rameshb@mits.ac.in

Second Author-Dr. S A K Jilani is working as the Professor and project coordinator in the department of ECE, Madanapalle Institute of Technology and Sciences, Madanapalle. He has the teaching experience of over twelve years. He also worked as an R&D Professional earlier in Electronics Industry. He obtained his PhD in the year 2002 and also published more than 35 papers in different national and international Journals. He has also guided more than 50 M.Tech, M.Sc, MCA, B.Tech Projects. His areas of interest are Artificial Intelligence, Computer Visions, Digital Signal Processing and Embedded Systems.
Email address:jilani_s_a_k@yahoo.com