



ENHANCED SECURITY SYSTEM FOR SCHOOL CHILDREN AND WOMAN TRANSPORTATION USING ARDUINO

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Abstract — This paper presents a system to monitor pick-up/drop-off of school children to enhance the safety of children during the daily transportation from and to school. The system consists of two main units, a bus unit and a school unit. The bus unit the system is used to detect when a child boards or leaves the bus. This information is communicated to the school unit that identifies which of the children did not board or leave the bus and issues an alert message accordingly. Identifying children RFID tag number using RFID reader along with corresponding bus number and driver phone number and then check for absentees, if any absentees found, send SMS to the child's parent with bus number and driver number. One button system should be there for women's individual safety system, use of the button is – when the button is pressed a emergency message is sent to any number (this number is considered as relative number or police station number for safety precautions) with current location from the GPS module.

Index Terms – RFID reader and tag ,GSM, GPS and Arduino

I. INTRODUCTION

Children safety is of utmost importance to their parents. Despite the best safety measures, children, due to their lack of skills to protect themselves, may end up in a situation that endangers their life (e.g.

crossing the road without paying attention to traffic). In this paper, we focus on a particular risk associated with the daily bus trip to and from school. There have been previous incidents where a child is forgotten in the bus and eventually die because of suffocation. To improve transportation safety, some schools employ a bus supervisor to look after the children inside the bus. Nonetheless, human oversight or supervisor absence may still lead to a heartbreaking ending as in the previously cited stories.

This paper presents a system to monitor the daily bus pick-up/drop-off of children to enhance the overall safety of the daily bus transportation to/from school. The system aims at automatically detecting when a child boards or leaves the bus and issue an alert message when a child does not board or leave the bus to reduce the parents' concerns about using the bus for the daily transport of their children without being lost or forgotten.

The rest of this paper is organized as follows. Section 2 reviews the most relevant work to the theme of this paper. In section 3, the overall system design is presented. Section 4 gives a detailed description of system implementation and testing. Finally, section 5 concludes the paper.

II. PROPOSED SYSTEM

A. *Details of the System:*

- RFID: used to turn on and turn off the module via HT12E.
- GSM\GPRS Unit: will contain module for transferring data, SMS to the external entities viz. relatives and parents.
- GPS Unit: containing cohesively made GPS module for obtaining the longitude and latitude of the kids location.
- The system should not be harmful for human beings or the environment.
- The device should hurt the child in any way.
- The system should provide an option to choose between different Languages.
- Children's information should be available for authorized personal.

B. Proposed System Design

The system is divided into two main units: bus unit located inside the school bus, and a school unit located inside the school. The bus unit is responsible for detecting the child when he boards or leaves the bus and then this information is sent to the school unit. The school unit is the central unit where it collects data from all the buses, adds them to the system database, checks if there are missing children, and it sends a text message notification to their parents. The proposed architecture is shown in figure

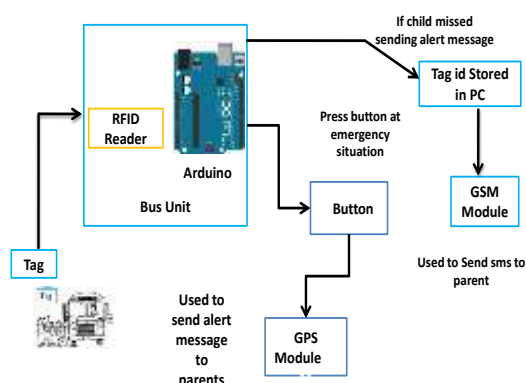


Fig.1 The Proposed System Architecture

Our proposed system provides the following advantages:

- The system uses RFID tags for children detection which is not harmful since it uses frequency ranges that are safe and legally approved.
- The deployment cost is reasonable.
- The system is automatic and user friendly.

C. The Bus Unit Description

The bus unit will detect the children when they board/leave the bus. It will use RFID technology to achieve this purpose. This technology consists of a reader and tags. There are three types of RFID readers based on their frequency ranges, low frequency, high frequency and ultra-high frequency. We chose to use UHF RFID reader, because it has a faster data transfer than the others. . Also, the distance can be controlled to be short or long as required.

The RFID reader will be located inside the school bus by the entrance. It will be positioned where it will only detect the children when they are inside the bus. But if the child was outside near the bus, the reader will not detect him. Each child will wear a card with RFID tag attached to it. The bus unit is responsible for sending relevant tag information to the school unit where it will be stored and processed. Based on the received information, other related child's information can be retrieved from the database for further processing (e.g. texting the parent).

There are two types of RFID tags, passive and active tags. We chose passive RFID tags since they have a short reading range which fit our requirement to detect the child when he is close to the reader (i.e. when s/he boards or leaves the bus). Moreover, they are cheaper than active RFID tags and need no maintenance in contrast to active tags that need maintenance and regular replacement of battery.

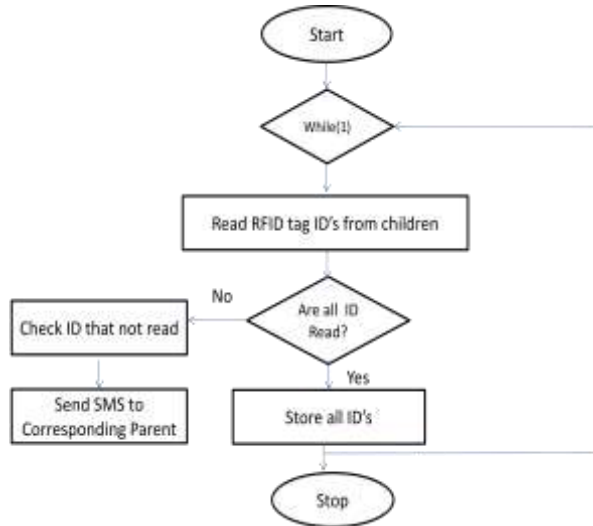


Fig. 3 System Flowchart

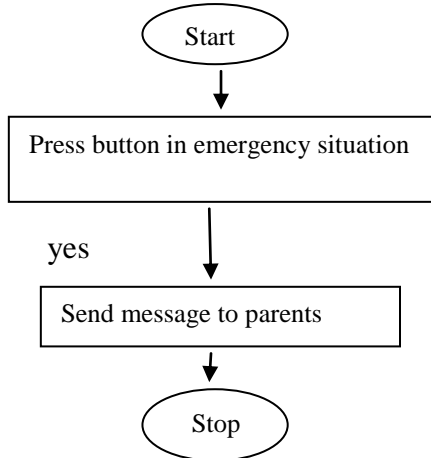


Fig.4 System Flowchart

D. Arduino Uno R3

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

III. RESULTS

The bus unit consists of an RFID reader, a GSM modem and a control unit as shown in figure 3. The RFID reader detects the children when they board/leave the bus. It is located inside the bus. The GSM modem is used to send this data to the school unit. A microcontroller is used to interface the RFID reader with the GSM modem.

The button system , a GSM modem and a control unit as shown in figure 4. After button pressed,the alert message was to parents. A microcontroller is used to interface the button system with the GSM modem.

A prototype of the system is implemented and tested. Testing is very crucial part to validate the functionality of the proposed system. It should be designed to increase the likelihood of finding an error and checking the functionality of the proposed system. The units were implemented individually at first and they were tested to check if they were working properly. Then, they were integrated and configured as required for the system. The unit test was held for all the units in our system: RFID reader and tags, GSM modems, GPS and school server.

A. The RFID Reader

The Reader was connected to a PC using RS232 cable. A terminal program was used to check if the reader can read the tags by setting the reader parameters appropriately (baud rate, start bit, data bits, stop bit, parity check bit). This was used to test the reader support

for multi-tag reading and verify the structure of the tags' numbers. Figure 4 shows the form of the tag number as the reader reads them where each tag number consists of 8 bytes in hexadecimal format.

B. GSM Modem

At first, GSM modems connectivity was tested using TMAS GSM-GPRS modem test program with the AT commands that are responsible for sending and receiving SMS and calling.

C. SMS Notifications

The PHP code written for the SMS gateway was tested. To use the SMS gateway, the following parameters are set: user ID, password, language, recipients, and the messages. The user ID and password are given by the gateway provider. The language has to be set before writing the text so that it can be sent properly. There are many integer values for different languages. For English, the value is 0 and for Arabic the value is 64. The text can be set to whatever the user wants to send. The result of testing the code is shown in figure 6.

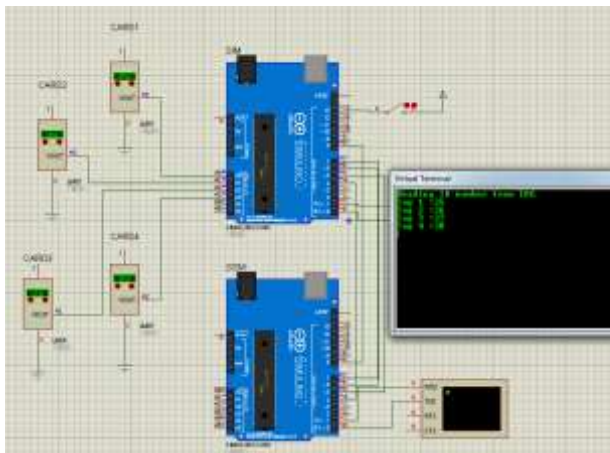


Fig. 4 shows the overall design of our proposed system

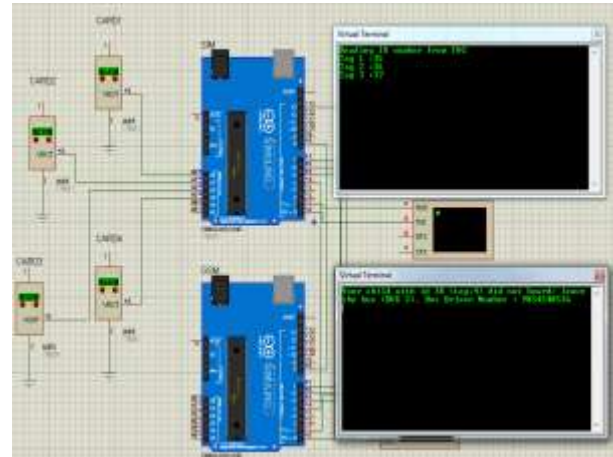


Fig 5 Shows typical serial output as SMS if any absent of children

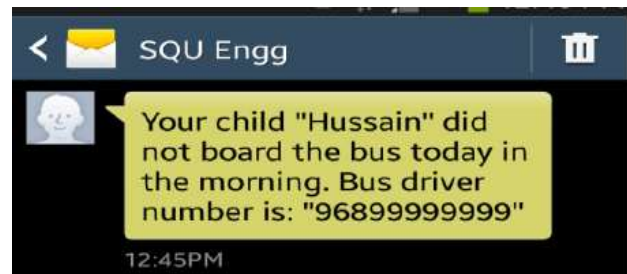


Figure 6 the parent notification message

IV. CONCLUSIONS

This paper presented an RFID-based system that aims at enhancing the safety of children during the daily bus trip to and from the school. RFID-based detection unit located inside the bus detects the RFID tags worn by the children. It then sends, via a GSM modem, the relevant data to the system database server. The system checks and detects which child did not board or leave the bus and issues an alert message to this effect. In addition, the system checks the children attendance and updates the database. The parents can log into system website and monitor the details of their children. In addition woman security was provided by sending alert message to parents, while in emergency situation by pressing button and GPS module used to provide exact position of woman.

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