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RFID-Based System for School Children Transportation Safety Enhancement

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ABSTRACT

RFID, short for Radio Frequency Identification, is a member of the Automatic Identification and Data Capture (AIDC) technology family, offering a rapid and dependable means of identifying various physical objects. This system is particularly valuable for security purposes, enabling the distinction between authorized and unauthorized individuals. It finds applications in real-time systems, such as tracking attendance in companies and industries to verify authorized personnel. Additionally, RFID is increasingly integrated with biometric technologies for enhanced security. The core components of an RFID system are the Transponder (tags attached to objects) and the Interrogator (RFID reader), which communicate wirelessly without requiring a direct line of sight.

In this project, the RFID module reader typically comprises a module with a transmitter, receiver, a control unit, and a coupling element (antenna). This module interfaces with a microcontroller, and when an RFID card is brought near it, the data on the card is read and displayed on an LCD screen. If the data on the card matches the information stored in the program memory, an authorized message is displayed. If there is no match, an unauthorized message is shown. Upon receiving an authorized message, the bus door automatically opens and closes after a brief delay. In the case of an unauthorized person, a buzzer is activated to alert individuals. The RFID module triggers the buzzer each time it reads data from the RFID card.

INTRODUCTION:

Ensuring the safety of schoolchildren is a paramount concern that necessitates leveraging cutting-edge technology. Innovations have emerged to provide secure protection for students, especially in cases of missing children within school premises or potential risks like abductions. RFID

technology, in combination with an advanced ARM 7 processor and GSM communication, has been utilized in the development of a working model. This system offers real-time information about a child's whereabouts, assuaging parental concerns.

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The heart of this system lies in RF ID technology, consisting of RFID tags affixed to students and RFID readers. These components communicate wirelessly at 125 KHz, and an EEPROM stores student details. The data can be conveniently accessed and managed by the school and parents.

One specific focus of this project is to enhance transportation safety for school bus journeys. Incidents of children being inadvertently left on buses and experiencing life-threatening situations prompted the development of this technology. While some schools employ bus supervisors, there's still room for human oversight, necessitating technological intervention.

This project showcases a practical application of RFID technology, demonstrating its potential through small-scale PCB manufacturing. It offers a glimpse of automation through RFID, emphasizing the fundamental components: RFID tags with unique IDs and RFID readers. Access to the data is made possible through a connected PC, enabling attendance management. The system not only improves safety but also streamlines attendance tracking with time management. Each RFID card is linked to a unique ID, and the system allows for real-time monitoring and entry/exit tracking.

late 1960s but has gained prominence with technological advancements. RFID systems involve tags (transponders) equipped with microchips and antennas, which communicate with readers via radio waves, akin to barcode systems.

A key feature of RFID is its non-contact, non-line-of-sight capability, enabling data retrieval in various challenging conditions. This technology extends its applicability to security and management in industries and companies, serving as a versatile solution.

The project's RFID system relies on FSK modulation, using 14MHz and 6MHz frequencies for signal transmission and demodulation. Successful communication between the reader and RFID tags has been achieved, with relevant student information displayed on the RFID Tag seeker GUI.

SYSTEM DESIGN:

In this project, the RFID module reader typically contains a module(transmitter and receiver), a control unit and a coupling element (antenna). This module is interfaced with the micro controller and when the card is brought near to the RFID module, it reads the data in the card and displays on the LCD

RFID, standing for Radio Frequency Identification, has a history dating back to the

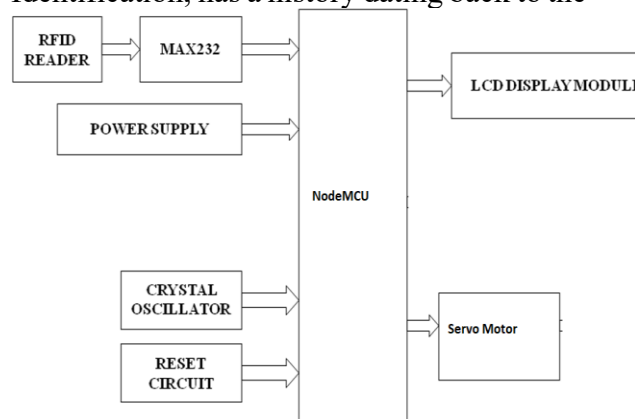


Fig1: Block diagram

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. 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 shown in the Figure.

The system employs a microcontroller to persist the complete task as shown in Figure- 2.1. First the RFID – Reader reads the information of the children who entered the bus at the boarding point and then forwards the information to the microcontroller, the microcontroller then forwards a message to the GSM modem informing about the arrival of student in the school bus and the GSM Module forwards that information to the respected child's parents. As shown above, the block diagram consists of three main subsystems: a transceiver, a decoder, and a display module. The antenna of the transceiver, which is shown to communicate directly with the tag, includes a 125 kHz transmitter with low distortion for interrogation of the tags, and a 62.5 kHz receiver to get the reply. The RFID tag will send its data as an amplitude modulated (AM) signal, so the reader will filter the signal to select and amplify the 62.5 kHz signal; after this filtering, the reader will demodulate the

signal to obtain the signal transmitted by the tag. Once this is done, the decoder will decode the signal transmitted by the demodulator and perform the necessary transformations to get the identification data, which in this case would be the MIT (Massachusetts Institute of Technology) ID number. Finally, this data is sent to a video display module to generate the necessary signals to output the data to a display.

SCHEMATIC DESIGN

Schematic design is the first phase. In this step, an architect talks with the client to determine the project requirements and goals. The architect usually starts with rough study drawings that illustrate the basic concepts of the design. This most often includes spatial relationships as well as basic scale and forms the owner might desire. Also, initial research of jurisdictional regulations is completed at this time. Initial cost estimations are also investigated based on total project size and complicity. Schematic Design often produces rough drawings of a site plan, floor plans, elevations and often illustrative sketches or computer renderings.

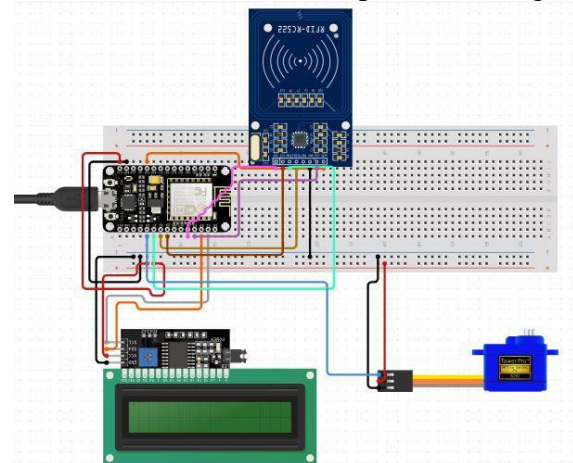


Fig2: Schematic connections

A full system design for an RFID system will be presented with the design algorithms and electronics circuits.

The hardware design and a complete analysis of the software application and the programs for both Tag and Reader will be explained. The electronic circuits as well as the program flow charts concerning the reader and tag circuits will be designed and implemented in order to produce a complete RFID system.

RESULT & ANALYSIS

In this project when the child boards the bus and places the RFID tag then a message will be transmitted to child's parent as "Your_kid_is_in_bus".

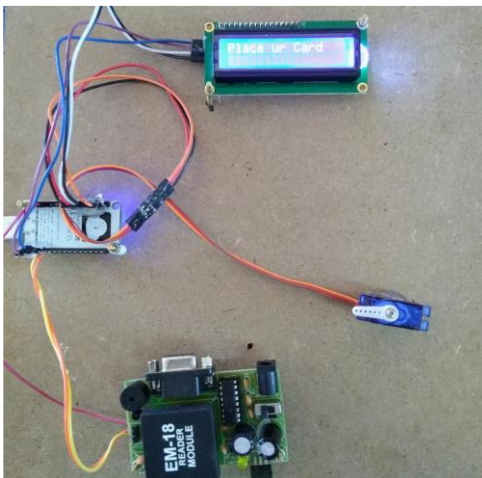


Fig 3: Initialisation

Now when the bus reaches the school, again the child will place the tag while leaving the bus in the bus unit and a message will be transmitted to the child's parent as "Your_kid_dropped".

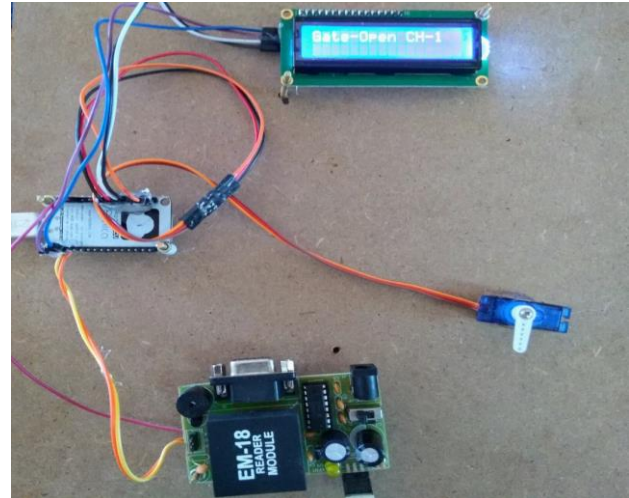


Fig4: Working

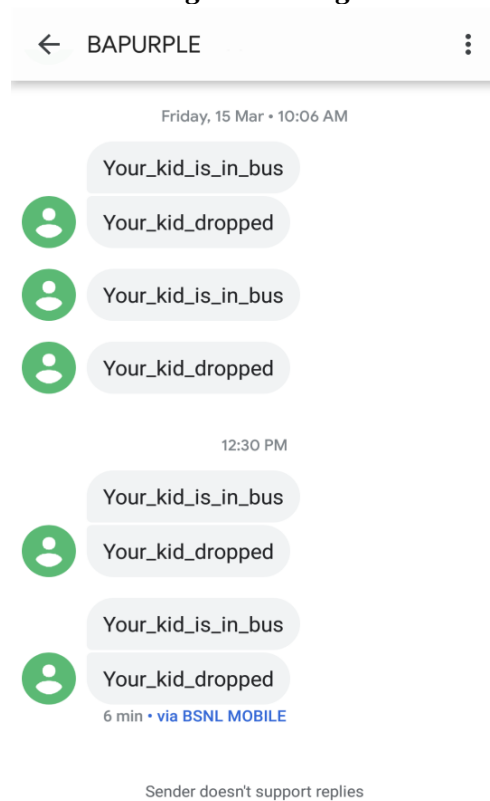


Fig5: Output

CONCLUSION

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 integration of RFID and GSM technologies for safety and security purpose is very important nowadays due to increase in accidents of children getting 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 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.

This project implementation primarily focuses on alert in case children enter into the wrong bus. RFID based detection unit located inside the bus detects the RFID tags worn by the children. This system checks and detects which child did not arrive the school and issues an alert message to this effect. The parent can log into system website and monitor the details of the children.

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