



A Survey Paper on RFID-based System for School Children Transportation Safety

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Abstract: Every year the crime rate of children keeps on increasing rapidly. The safety of children is the topmost priority to their parents. Despite taking various measures regarding the children's safety, children fail to protect themselves in several endangering situations. Most likely, children who travel to school without the aid of their parents are exposed to danger. Previously, there have been several cases where children have been forgotten on the bus and eventually died due to suffocation. So in this survey, the main objective is to develop a system to acknowledge parents about the entry and exit of their children during their journey to and away from the school. To implement this monitoring system, RFID (Radio- frequency identification) and GSM (Global System for mobile communication) is used. The main unit of this system is the bus unit, which detects whether the child has entered or exited from the bus. This information will be recorded in the database maintained by the school using RFID technology. The database is further analyzed and communicated. The School unit finds which one of the children did not deboard or board the bus. Simultaneously, parents receive SMS about the entry/exit of their children from the bus

Keywords: RFID, System integration, Design in Engineering, Transportation Safety, Detection.

I. INTRODUCTION

The safety of their children is of the highest concern to their parents. On a daily basis millions of children travel to and from school. Even though several safety measures are taken for children, they fail to protect themselves, ending up in an endangered situation. Several bitter incidents force the development of an innovative methodology in order to provide security for children. Technology being used should be crucial enough to keep our society safer. In this survey, the focus is on a specific risk analogous to the daily bus journey to and from the school. There have been preceding cases where a kid was being abandoned on the bus and ultimately died due to asphyxiation.

To improve transportation safety, several schools engage a supervisor to supervise the students on the bus. Nonetheless, the lack of human control or supervision might result in a heartbreaking finale.[1] So the main focus of the system is on one particular issue, that is children being forgotten on the bus. In recent years, RFID has evolved into a more sophisticated technology. Because of its high productivity, RFID technology is widely used in a variety of applications. In terms of applicability, it has been a popular tool for monitoring transportation for a very long time. RFID has a higher value since it is considered a critical component of the Internet of Things.

The RFID system is made up of two main components: The reader and the tag.[6] The system involves various responsibilities, like recognizing each student's information using the RFID tag, which will communicate with the RFID reader to exchange data through radio waves and display each student's name on the LCD display. This gives the driver the students count who are present inside the bus and those students who have left the bus. It also has an alert mechanism that sounds an alarm if a youngster is present on board after the bus has arrived at its destination. This is accomplished by sending a text message to the administration of the school using the GSM modem. SMS messaging is one of the most important revenues of wireless carriers. The number of messages exchanged every day is very enormous. In addition to this, if the bus departs and arrives successfully from the source to the destination, it will inform the management through



an SMS about its successful departure and arrival.[2]

An RFID reader, also known as an interrogator, is a device that connects the tag data to the system software that requires the information. The reader only interacts with tags that are within its range of operation. The antennas used by the readers are used to capture data from the tags. Later it passes the data to a computer to process. Similar to the RFID tags, there are many varieties in the RFID readers. Readers might potentially be integrated into cars, electrical gadgets, and other hardware. RFID readers and antennas collaborate to read tags.

The job of the reader antenna is to convert the electrical current into EMW, that are then broadcast into space and collected by an antenna, where they are transformed back to electrical current. Reader antennas, like tag antennas, come in a variety of shapes and sizes, with the best antenna for the job varying depending on the analysis use and environment. It has been revealed that linear antennas are too sensitive to tag orientation. linear antennas have a tough time reading tags depending on the tag angle or location. Circularly radiating antennas, on the other hand, are less sensitive to orientation but cannot produce as much power as linear antennas. The environment has an impact on antenna choices as well.

GSM is Global System for Mobile Communication. GSM enables mobile users to interact all around the world. GSM was created with the intention of being platform agnostic. Because GSM provides a common standard. Cellular customers may use their phones everywhere in the GSM region, which is anywhere the GSM system is used. Furthermore, GSM provides user services such as high-speed data connection, facsimile, and a Short Message Service (SMS). The technical criteria are intended to operate with other standards since they ensure standard interfaces. The essential feature of GSM is that its standards are experimental and may be expanded to satisfy other requirements

The GSMC is a system that allows messages to be sent and received across many mobile phones. The SMS was incorporated in the GSM (Global System for Mobile Communication) specifications from the outset. The standards of GSM and SMS were originally developed by the ETSI (European Telecommunications Standards Institute). The Short Message Service (SMS) is a service that only sends a little quantity of data. A single SMS message can contain at most 140 bytes of size and cannot exceed above that.

The GPS receiver's position is determined by accurately timing the signals transmitted by satellites orbiting the Earth. Each satellite sends communications that include the moment the message was transmitted, accurate orbital information, system health, and approximate orbits of all GPS satellites. By measuring the propagation time of these signals, the receiver estimates the radius to these satellites. The process of estimating the receiver's position by combining the distances with that of the location of the satellites is known as geometric trilateration. There are various GPS units that show the derived information such as the direction and the speed, calculated from the changed position. It might seem three satellites are enough to solve for the position since space has three dimensions. Even, a small clock error multiplied by the large speed of light at which the satellite signals propagate can result in a very large positional error.

II. OBJECTIVES AND GOALS

The project's aim is to give out the following goals and objectives.

- (i) Aim: The project directs at accommodating a better safety to the school children by means of monitoring the boarding and deboarding from their school bus supported by the RFID technology.
- (ii) Objectives: **Concept initiation and selection** – The first step in the project is to find a better idea that supports the project's established features and parameters.

Preparation - Research and surveys help in determining how to use tools, techniques, and procedures to develop a technical concept that can be evaluated for commercial objectives.

Requirement Analysis - To scrutinize the project requirements, that include the idea development and selection, definition and value proposition, research and function of concepts, and a feasible approach.

Design - A technically directed representation to be used to design the system architecture that is based on the project requirements.

Design Implementation - To implement and verify that the system is implemented using the appropriate technology.

Outcome - To develop a system that is practically applicable. Monitoring of the school children during their bus journey to and away from the school.



III. LITERATURE SURVEY

This survey was done on particular methods that are commonly used by the school bus system for tracking purposes. We studied each work and its features and disadvantages and learned something new from each system. The bus driving mechanism is capable of moving the bus without deviation, and children security is imported to boost the real-time application in [1]. In the future, this suggested mechanism will be supplemented with an anti-collision and biometric system to replace the present RFID Technology. This paper involves the initialization of the Port and reading the vibration sensors at the ports. And to read the RFID reader, if the tag is being found then the counter is incremented, else it sends an "Absent" message to their respective parents. It involves enabling bus driving mechanisms. Also, check the destination point. And later the RFID reader decreases the count.

Author in [2] aimed at the safety of school children during their bus trips. This paper was based on RFID and GSM. They used an LPC2148 Microcontroller. By using this, system alerts were sent to the concerned authorities and bus drivers. It also sends alerts via GSM Modem to the management for making the right decisions. The paper shows that RFID technology-based tracker system acts as one of the best solutions to enhance the safety in the school buses, which will reduce the accidents of forgetting the students inside the bus. Here Technology of GPS and GSM and all together are integrated into a system which results in progressive and sensible implementation.

Researcher in [3] confers on the RFID-based system which intensifies the children safety during their everyday journey through the bus to and away from the school. The system's operation is primarily separated into two components, with each student carrying a card with a unique identifying number. When the student boards the school bus, he scans his ID card. There are two switches, one for arrival and one for safe departure; thus, while returning home, the student should touch the arrival switch and then enter the school bus. As soon as the kid scans the card, a message is sent to the parents through GSM informing them that their child has arrived at school.

Author in [7] have made use of the MQTT protocol for communication purposes. Here Node MCU is used in order to sense or find whether the driver is drunk or not. Node MCU is an open-source Lua-based firmware and development board designed specifically for Internet of Things (IoT) applications. Node MCU is having 4MBytes of ROM (flash) and it comes with a micro USB port and a micro USB cable that are easily available. The scanning of the RFID tag is combined with the ID card of the child. The system includes GPS technology that sends the exact location of the bus to the School unit and the parents. Thus IoT makes it even easier for the system to communicate.

Author in [5] uses RFID and GSM SIM900 to monitor the entry and exit of school children from the bus. The ID20LA innovation is used in the experiment since it is the most common type of ID. It can scan any RFID card within its range, as well as any microcontroller. The system connection is made with the ISIS 7 Professional (Proteus) program which combines ease-of-use with powerful features in order to design, test, and layout professional PCB. It is a program that simulates the interaction of software running on a microcontroller with any analog or digital devices linked to it. PIC18F45K22 is one of the PIC microcontroller which has been selected for this demonstration. The PIC18F45K22 has design features that make it the ideal solution for most scenarios. This PIC has low power consumption, high performance, high computational performance, high endurance, and flash programme memory, to name a few qualities.

The study [6] provides an automated approach in the Public Transportation System based on traveler identification. This is an understandable system that automatically recognizes the passenger and deducts the fee based on the distance traveled. RFID cards and GPS are used to provide exceptionally accurate passenger and transaction identification. The cards are significantly more accessible than the paper-based ticketing system since they are reusable. The unique ID that is included in the RFID cards is stored in an online database. It is feasible to identify the passenger, confirm his account, and deduct the fare from his account by getting this information. The implementation of a database leads to effective anti-social factor screening and offers passengers and PTS confidence in the transaction. A GPS device and the internet are used to determine the fare. A disparity in fare does not cause any ambiguity since fare computation is done by evaluating position via GPS module and rate over the internet. As an outcome, human error and effort are reduced as a result of the technology. MFRC522 is the RFID reader that was applied. The Raspberry Pi is implemented as a control device, and Python is used to programme it. The GPS module 02 is employed for distance estimation. Control and monitoring are accomplished by servo motors and LCDs, accordingly.

A bus security system has been developed, according to a researcher in [8]. Because this RFID card is visible, it may be used to notify appropriate authorities and bus drivers. Simultaneously, If a pupil is on the bus, the system sends a text message to the school administration, allowing them to make the appropriate decision. The key concerns with RFID are



dependability, security, and privacy.

IV. COMPARISON OF PRESENT AND RECOMMENDED SYSTEM

SI No	Functionality	RFID System	Zig bee	Barcode System	Recommendation System
1	Based on Arduino	Yes	Yes	No	Yes
2	RFID Sensors	Yes	Yes	No	Yes
3	Bluetooth	No	No	No	Yes
4	IoT based wireless communication	Yes	Yes	No	Yes
5	Barcode Scanner	No	No	No	Yes
6	Location Tracker	No	No	No	Yes

V. RESULT

Both RFID and GSM technologies are linked by a microcontroller, and varying data is supplied to the GSM modem, which is concurrently shown on the LCD, as well as messages sent to the parents. We can discover that the student can be watched using this RFID technology and can properly communicate the child's status as an SMS to the specific parent through this survey and the implementation techniques employed in it. The system may be managed via a short message service from any place that has GSM coverage.

VI. CONCLUSION

This survey report highlighted an RFID-based device that intends to improve children's safety on their daily bus commute to and from school. The schoolchildren's RFID tags are detected by an RFID-based detecting device that is housed within the bus. It then sends this necessary data to the system database server via a GSM modem. When the technology determines which child failed to board or depart the bus, an alarm message is generated. This message is also communicated to the child's parents. Furthermore, the system monitors the children's attendance and refreshes the database.

Parents can access the system database online and check their children's attendance and login information. According to the findings, an RFID-based tracker system is one of the most effective ways to increase school bus safety by lowering the number of incidents caused by students being left behind on the bus.

VII. FUTURE SCOPE

Future development includes integrating RFID tracking with an information management system to produce accurate kid tracking that offers users a variety of uses. Once the following steps are completed, the system will be capable of contacting parents through SMS when their child enters/leaves school, allowing school administrators and parents to maintain track of the bus. It also assists carriers and authorities in better planning and management of bus routes, saving money and assuring smooth and swift travels to various locations. This proposed approach can be improved by adding an anti-collision mechanism and a biometric system to replace the present RFID technology.

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