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Smart School Van Safety System: Advanced Monitoring, Emergency Response, and Parental Alerts

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Abstract

An advanced and novel system for monitoring and tracking the school van to ensure the safety of children, the proposed system works in case of emergencies such as accidents, breakdowns, and fire accidents by immediately sharing the location and images of the inside environment of the bus with the school authorities and parents as well. Images are captured using a camera, and location is determined by a GPS module. Radio Frequency Identifier (RFID) tags are used to track the number of students traveling. Further, one panic button and a couple of other keys were also provided for security enhancement, where the first button is utilized if there is an emergency and the latter is used when the vehicle gets stuck or breaks down. With the advancement of the Raspberry Pi, every time a key is pressed, an email alert will be sent to the parents and the school management, as well as the inside snapshots of the vehicle. Moreover, it is also implemented to control the speed of the vehicle when it exceeds the average speed, which prevents rash driving and reduces the percentage of accidents.

Keywords: *Raspberry Pi, Radio Frequency Identifier, Switches, camera, speed sensor, GPS.*

1. Introduction

School children safety is the most significant component encouraged to precede research with the support of advanced technology. Several bitter incidents forced to develop an innovative methodology to provide secure life for children. Parents are unable to feel comfortable until the child resumed back to home safely. Missing of the students at school premises, anti-social elements kidnappings etc are increasing in an advance. Technology should be imperative to safeguard the society since in recent years, we have been seeing or reading about the school buses involved in mishaps, negligence by the drivers, children missing cases and other hazards. The proposed system focuses on the monitoring and tracking of the school bus and thereby minimizing the hazards that may occur. In the proposed system, a low-cost Radio Frequency Identification (RFID) has been implemented. RFID is a technology which is used as an alternative for manual scanning in order to detect human beings plugged with RFID tag [1]. The tag need not be within the line of sight of the reader, RFID is one method for implementing AIDC (Automatic Identification and Data Capture), RFID cards are also used in order to identify the entity [2]. The proposed system provides automated tracking and monitoring of the vehicle which is helpful for school bus, their owners and children's safety [3]. It also provides a panic switch and two keys. Panic switch is used in case of emergency and keys are used if the vehicle gets stuck in traffic and in case if vehicle break downs. On pressing the mentioned buttons, an image of the inside environment of the school bus along with the co-ordinates of the location will be mailed and a message will be sent to the school authorities and parents [4]. Hall Effect senor is used, it works by sensing the magnetic field, once the speed limit exceeds the specified limit then the Raspberry Pi sends the mail to the school authorities.

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For tracking the vehicle using GPS and maintain its database, MySQL database system is used along with advanced feature of Raspberry-Pi. In the database base monitoring and updating mechanism. Date, Speed, Time at which the vehicle was tracked and store into the database of Raspberry Pi. The proposed Pi system will provide students safety mechanism. For tracking the vehicle using GPS and the advanced feature of Raspberry-Pi. This technology based on Raspberry Pi provides few more advanced features to use in our project. The idea of tracking the vehicle can be enhanced with the current location of the vehicle. In tracking applications, it is desirable to know the accurate location of a tag in the reader area. A new method is proposed for accurate positioning of RFID into some unit cells of triangular shape [5]. Each unit cell is covered in order to extract the position of the tags. By adding this capability to conventional chip less RFID systems, they can be used in crucial applications in a wide range, such as health care monitoring. By using GPS, we can track the location of the school bus [6]. This method invokes an idea for detecting the school bus in the case of emergencies.

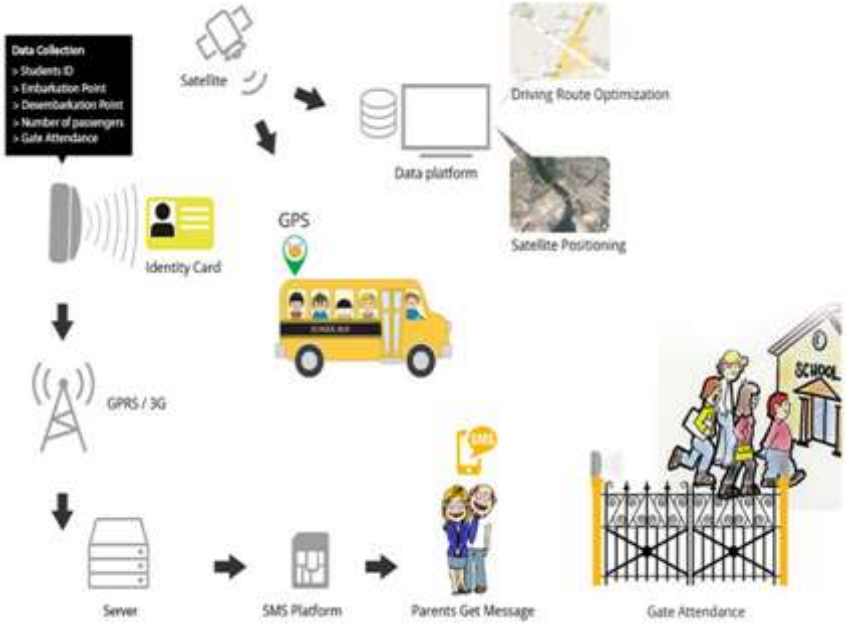

Figure 1. System architecture

2. Related Work

Khaleed shaban adopted RFID Technology to safeguard the children from wrong identification of their destination location, method to curtail the students sleeping in the bus itself without leaving to classes. This paper also focused to provide the security to the children from starting location to the destination point with applied RF technology [7]. Seong Shaban described the security of the children at school Zone premises. This paper adopted a wireless sensor network methodology to identify the vehicle license plate number while moving with high speed. This paper also focused to trace the unauthorized parking vehicles at the school zone premises to safeguard the children from the accidents from the hidden zone areas [8]. G. Bharathi, L. Ramurthy proposed a mechanism to trace the missed student using GSM- GPS technology. An ARM 7 is used to process the given information and to send the appropriate location of the missed student by adopting the GSM technology. The Missed student Latitude and Altitude locations are determined by adopting the GPS Technology [9-11]. V. Sivasankaran et.al proposed a RFID –GSM technology to provide the security to the school children. The RFID tags are attached to the children bags for tracking and GSM is used to send the messages to the parents [12]. M. Navya et.al Proposed GSM-GPS technology to track the children students. GPS is

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used for identifying the student location. GSM is used to send the information to the parent android mobile. Monitoring database is provided at the control room of the school [13].

3. Proposed System

Primarily, intimating the parents about the pickup and drop off activities of the children through an E-mail and SMS alert. Second, informing students' parents in case of emergencies with the corresponding messages in SMS and an Email along with the attachments of location and a picture of inside environment in the bus will be sent to the parents. Third, intimating school authority in case of rash driving carried out by the driver at a particular point of time.

To use RFID technology in the field of intelligent monitoring of buses not only solving the high-cost problems in the GPS/GPRS technology and changing the traditional way of human experience-based scheduling, but also monitoring buses running on the road in real time. What's better, it can improve the quality of service and bring convenience to public. RFID is a kind of automatic identification technology. It achieves non-contact data communication by sending radio frequency signal. RFID system consists of two parts, the electronic tag and reader. Its basic principle: after entering the field, the tag receives RF signal emitted by the reader (installing each station) and It sends out the product information stored in the chip by using the energy gained from the induced current, then sent to the application program on data processing. Intelligent transportation system based on RFID solutions does not rely on satellite signals, with no complex GPS system. Using of RFID technology will not be the problems, there by safeguarding the long-term stable and reliable system operation. The concept of RFID reader here, invokes an innovative idea to find a communication way between the identification and the Raspberry Pi.

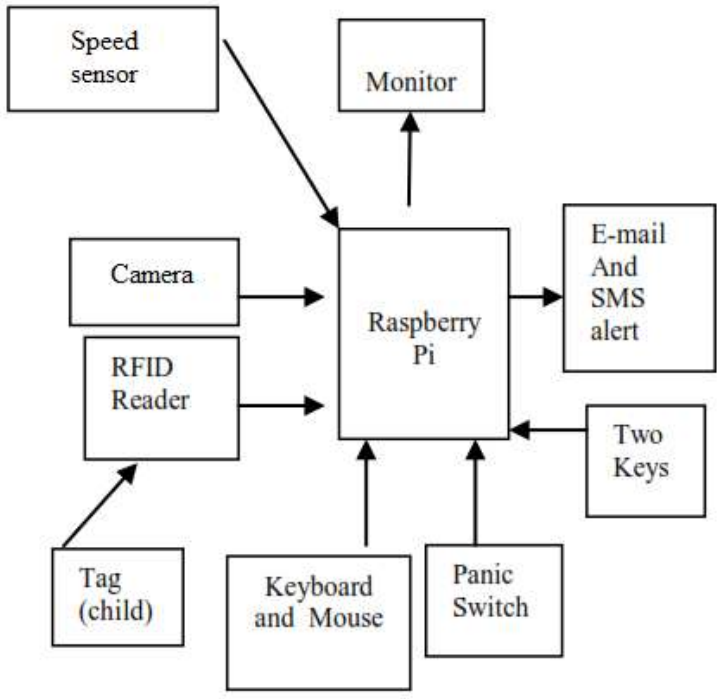

Figure 2. Proposed safety system for school children.

4. Software Requirements

According to the latest TIOBE Programming Community Index, Python is one of the top 10 popular programming languages of 2017. Python is a general purpose and high-

level programming language. You can use Python for developing desktop GUI applications, websites and web applications. Also, Python, as a high-level programming language, allows you to focus on core functionality of the application by taking care of common programming tasks. The simple syntax rules of the programming language further make it easier for you to keep the code base readable and application maintainable. There are also several reasons why you should prefer Python to other programming languages

4.1. Cloud

Cloud storage is a model of computer data storage in which the digital data is stored in logical pools. The physical storage spans multiple servers (sometimes in multiple locations), and the physical environment is typically owned and managed by a hosting company. These cloud storage providers are responsible for keeping the data available and accessible, and the physical environment protected and running. People and organizations buy or lease storage capacity from the providers to store user, organization, or application data. Cloud storage services may be accessed through a co located cloud computing service, a web service application programming interface (API) or by applications that utilize the API, such as cloud desktops to storage, a cloud storage gateway or Web-based content management system.

5. Conclusions

The project is intended to be designed using structured modelling to provide the desired results. Different technologies have different methodologies to implement the monitoring of school bus, more precisely safety of children in school bus. The proposed system is intended to play an important role in real time monitoring and intended to provide safety and secure solution to the students and parents. An SMS alert is sent to the parents whenever their child boards the school bus and when the child is dropped from school at the dropping point. Whenever there is school bus accident, the system provides the condition of students by an E-mail and SMS alert. The E-mail alert is provided along with the images of the internal environment in the school bus, and the location of emergency. An alert message is sent to the school authority if the school bus driver carries out rash driving at any point of time.

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