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Acute school bus surveillance and notification system

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ABSTRACT

Everywhere around the world, school children's safety has become a major priority for both the parents and also the school administration. Every parent thinks about the safety of his/her kid. Then why not think about the safe transportation facility that could be provided by the schools? The major concerns of both the parents and the administration are about the route that the buses take, student's attendance on the bus, and also the speed that the bus travels with. Another concern that the school administration might face is the usage of fuel by the driver. The proposed system improves the safety of the children along with giving the parents and the administration of peace of mind. This work displays a framework in which it gives a presentation about the monitoring of the bus using a GSM module along with the location of it, the information about the student present on the bus using the RFID Tag, and when in an emergency, the motor is controlled by the relay module, with the help of an ultrasonic sensor the level of fuel can be identified and also the speed of the bus is calculated. These hardware models are connected to one another by the microcontroller and from this information about the student attendance, the speed, the fuel level is shown to the administration with the help of cloud through a Wi-Fi module. In this manner with a wireless module, we can ensure the safety of each and every child present in the bus and also parents and the school authorities can keep a tab on the children and also the driver's behaviour.

Keywords— RFID, GSM Module, IoT, Safety, School Bus, Sensors

1. INTRODUCTION

Nowadays there is no limit to the kind of crimes committed in the world. Many of these include abducting school children. Many school children's lives were at risk because of the lack of proper safety. To ensure the safety of each and every child we need to improve the safety measures around them. One of such a safety measure could be bus surveillance.

This project presents the headway of a school transport watching structure, fit for giving productive organizations through rising advancements like the Internet of Things. On an exceptionally abnormal state, IoT is the capacity for things that contain installed advances to detect, impart, interface, and work together with different things, hence connecting a system of physical articles. Lately, this idea has increased colossal energy and is presently a standout amongst the most discussed things in the realm of innovation today. It has the capacity to remotely screen and control gadgets for a person's peace of mind. IOT makes every situation on a daily basis as connected as together on a wireless basis. These days we nearly have a web framework wherever and we can utilize it at whatever point. Implanted processing gadgets would be presented to web impact. IoT tries to build up cutting edge availability (with the guide of the web) among numerous gadgets or frameworks or administrations so as to gradually make robotization in all zones. The picture that all things are associated with each other and all that associated data would be interfaced to one another over standard and distinctive convention area and applications.

With this project, we tend to give every child that security and peace of mind to every parent. It is executed to give a real-time location along with an emergency alert text message in any immediate circumstance caused. Through this framework we can get real-time monitoring of the school bus along with a route planning, also helps us analyse driver behaviour by giving us the speed data which are transmitted through the sensors. There is also a panic emergency button which sends a text to an associated mobile number intimating that there has been an emergency situation on the bus. This ensures the safety of school children with exact and opportune reports.

2. RELATED WORK

A design for controller area network bus real-time monitoring system (Piao Chang-hao, Chen Lu, Cao Ju, 2011, [1]). In this system, they used LabVIEW (VI-visual instrument) to compile CAN, in which the CAN (Controller area network) bus/system can real-time monitor the bus state.

Intelligent bus monitoring system (Neha Shinde, Saniya Ansari, 2017, [2]). This project defines the working principle of the GPS/GSM system interface that includes the emergency & bus fail to switch using the rule-based decision algorithms, which is especially used for accident detection.

Design and Implementation of Vehicle Tracking System using GPS/GSM/GPRS Technology and Smartphone Application (SeoJuLee, Girma Tewolde, Jaerock Kwon, 2014, [3]). These papers include LED panel smartphone application, Arduino microcontroller Atmega328 based Arduino UNOR3 microcontroller. The main purpose of this paper was to evaluate the fixed route, check the status of the bus along with a testing in-vehicle device, web server and smartphone application.

Intelligent Bus Monitoring and Management System (M. A. Hannan, A. M. Mustapha, A. Hussain and H. Basri, 2012, [4]). This paper proposes ruled based decision algorithms and a new theoretical framework that helps reduce the manpower required at the monitoring centre, efficient bus circulation system.

Real-time Web-based vehicle tracking using GPS (Muruganandham and P. RMukesh, 2010, [5]). With this paper, we can real-time track over the internet by TCP/IP connection through Java applications by making use of the GSM/GPRS modem and a GPS system.

Public transport ticketing and monitoring system (V. Venkatakrishnan, R. Seethalakshmi, 2012, [6]). This paper deals with the Microcontroller and PC based system which deals with the GPS tracking in order to send an alert message in an emergency.

Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem (C. Prabha, R. Sunitha, R. Anitha, 2014, [7]). This particular paper involves a GPS tracking system and GSM alerting system based algorithms, EEPROM is interfaced to store the mobile numbers permanently for altering system. It offers higher sensitivity and accuracy with a very user-friendly environment and also being reliable.

Design of punctually enhanced bus transportation system using GSM and Zigbee (Madhu Manikya Kumar, K. Rajesekhar, K. Pavani, 2013, [8]). This paper includes Wireless Sensor Network, PC based system to monitor the system which acquires the location analysis, sending information to the server.

GNSS based bus monitoring and sending SMS to the passengers (N. Vijayalashmy, V. Yamuna, G. Rupavani, A. Kannaki, 2014, [9]). In this paper, the authors concentrate on RFID monitoring, location tracking and alerting while also providing an easy system upgrade and user-friendly behaviour.

3. SYSTEM ARCHITECTURE

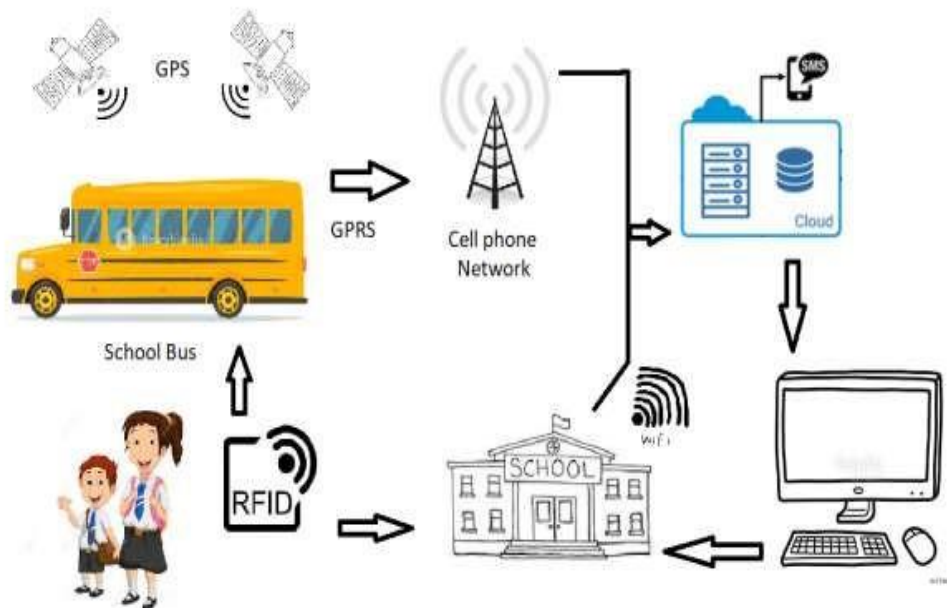


Fig. 1: System architecture

Till date, not all schools have this kind of a safety measure to ensure the security of their students. One of the main features of this project is that the motor is stopped by the relay module when the emergency button is activated. This ensures no further damage to the passengers on the bus. In the client's point of view, the framework will offer greater security in checking the speed control of the driver, mishap crises and so on. This framework is useful for taking care of the issues of guardians and the school board. They can follow their student's location by utilizing GPS. An RFID tag is utilized to recognize the kid in the transport with the assistance of pursuer present in the transport. GSM innovation for sending the message to the school authority if there should arise an occurrence of any crisis circumstances. It additionally gives alarm caught in crisis. Regular information of the understudies is put away in calculated administration which the organization can experience. Through this wireless model we can get real-time monitoring of the school bus, can format the over speed metrics along with the Panic alarm for emergency situations and also Fuel usage surveillance.

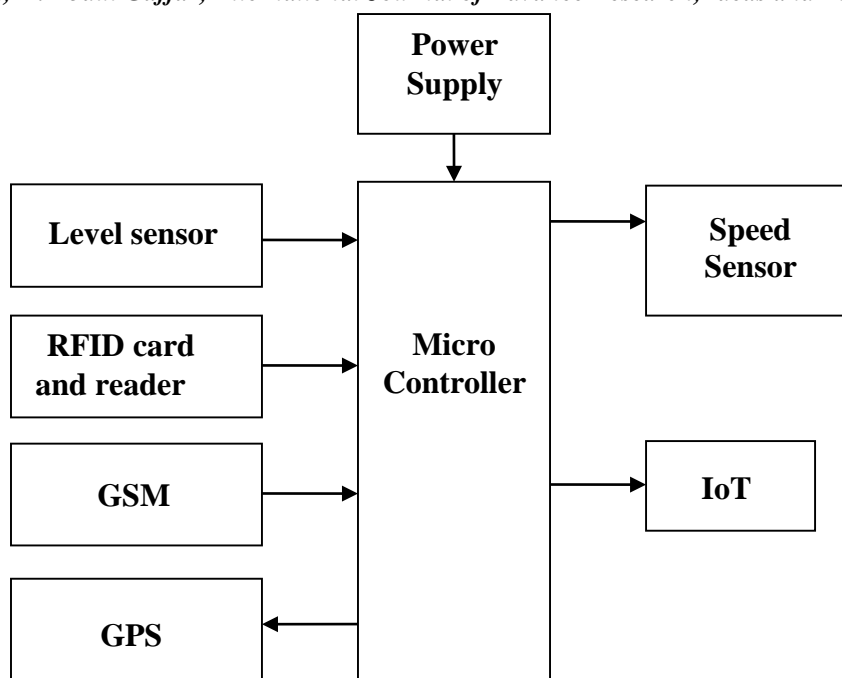


Fig. 2: The Block diagram of the proposed system.

4. IMPLEMENTATION

The outcome of this framework is the wellbeing of school kids amid the day by day transportation. RFID Reader situated inside the transport identifies the RFID labels of each and every student. It sends moment notice with the pertinent information to the school database server by means of web. The organization can sign into the Application and screen and track the area of the transport.

The administrator can and produce an enhanced route and can have a live track of the transport. The transport can be followed by the school at any moment, this guarantees the transport is moving in the pre-chosen course and any unscheduled stoppage or course deviation can be noticed. And also when in an emergency, as soon as the emergency button is pressed the motor is topped by the relay module simultaneously sending a text reading 'EMERGENCY' to the school authority.

4.1 Data accumulation within the hardware

The sensors: Level sensor (Ultrasonic Sensor), Speed Sensor, Buzzer, along with the Wi-Fi module, RFID module, GSM module, Power supply, the emergency switch, the motor, all are connected to the PIC microcontroller.

The controlling of each sensor and each module is already dumped into the PIC 16F877A microcontroller using a compiler, through which the data is collected accordingly. This data flow happens in a polling manner.

When the power supply is switched on, the motor starts running. The Wi-Fi module (user: xxxx, password: xxxx) is connected to a portable Wi-Fi network on android mobile to connect it to the cloud. Collected data is then sent to the cloud server and is stored in MYSQL database. Through this, the data is collected and stored in a database which can be viewed on the webpage of the administrator. Only the school authorities will be able to view this information.

- Speed sensor gives out information in such a way that the speed of the motor is calculated by how much RPM the motor rotates and stores it in a real-time manner showing the date and time accurately.
- The Wi-Fi module in which the TX of the PIC is connected to the RX of the Wi-Fi module sends out data to phone connected hotspot which further connects to the cloud and forwards it to the cloud.
- The RFID module collects the data from the RFID tag that is present with every student. This data collected is then stored into the database, from where the administration can see which student is on board and which student is not.
- The ultrasonic sensor which acts as the level sensor sends the information in three formats according to the amount of fuel present on the bus.
 - FUEL_FULL
 - FUEL_MEDIUM
 - FUEL_LOW

4.2 Emergency Situation

In an emergency situation, when the switch is pressed, the buzzer goes off. The buzzer starts making noise for some a few seconds and that's when the relay module comes into play. The motor is turned off by the relay module to stop any further damage. Simultaneously during this situation, a text is automatically sent to the school authority to the registered mobile number. This relay module is an automatic switch or also known as a mechanical switch. When the accident occurs, to turn off the motor this relay module trips the circuit. The controller gives the command to the relay to stop the motor.

This happens because of the code written into the microcontroller which allows the text message to reach the authorities. In such a situation once the text is received the administration can check the real-time location of the bus using the desktop. Every detail of the location is updated in a real-time manner.

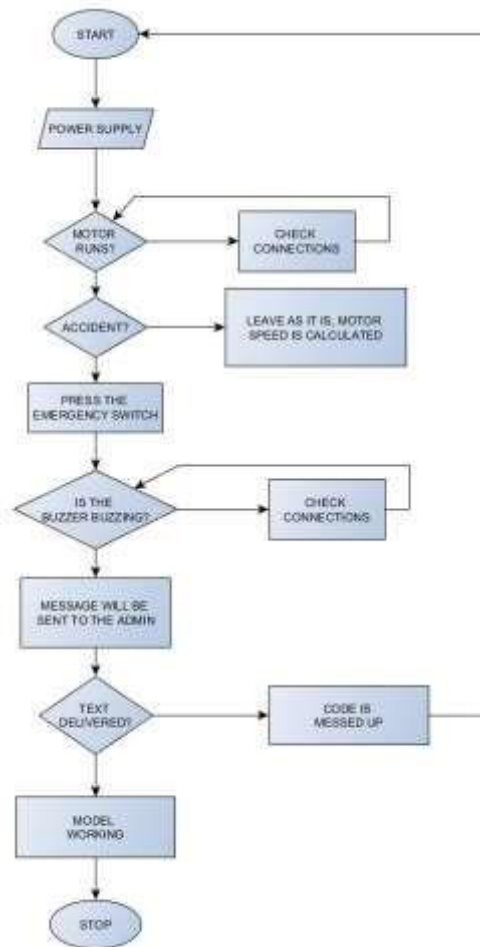


Fig. 3: Data flow of the system for the emergency text message

5. CONCLUSION AND FUTURE WORK

This paper demonstrates that transport surveillance and notification framework transport innovation is achievable for regulating and following the school children amid their drive to and from school. Additionally, the speed control, mishap crises, and frenzy switch assume a noteworthy job to improve student's security. This GSM following arrangement is customized for the particular necessity to oversee school transport armadas, send continuous updates to the school, and screen transport area. With a wide scope of SMS alarms, the framework has powerful capacities to upgrade courses, track live areas. The paper also manages the checking of school transport. It is created to give broad highlights to school management and improves the checking of the school transports dynamic on the diverse courses. This framework comprises of sensor arrange teamed up with the web. To convey the framework's information. The proposed arrangement is versatile and future prepared.

- Complete authority over school transport - Full power over school transport can upgrade the wellbeing of school children exponentially. With full command over transport administrators and keep up their transports in great condition. Full control incorporates safety belt recognition. Cap open location, remote speed control, tire review, and so on school transport can be remotely worked by administrators to improve authority over it.
- Collision evasion framework on the transports - Collision shirking framework can be executed on the transports. It can be made sure to be programmed or can be worked with remotely. Utilizing sonar and fast processors we can recognize any crash ahead of the transport, identifying an impact would trigger a broken framework to stop the transport. Utilizing this we can evade front head impacts. For back impact, we can embed some retentive material or a material which can repulse back motor vitality granted to it.

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