

Design and Implementation of IoT Based Smart School Bus Monitoring and Notification System

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Abstract- It is important for every school to have a trustworthy and secure transportation service to ensure the safety of the students. It helps the school administration to effectively manage their bus fleet and potentially reduce mishaps. This is where vehicle monitoring takes effect. The proposed system provides real time information about various parameters of the vehicle like the Driver wearing Seat belt or not? , Alcohol detecting sensor, the speed, fire detection and much more. The system further allows the parents to be notified when their ward alights or boards the bus. In this system, we make use of Finger print sensor and GSM technologies. R307 Optical Fingerprint Reader Module identifies each student as they board or alight the vehicle by reading the id from their Finger print. The system uses the GSM sim900 module to send the information from the peripherals to the respected person. The information can be accessed by the parents through a mobile and this helps them track their wards effectively. The school administration can also access the application to ensure student safety and contact a driver or a parent. The system also allows the administration to be informed of emergencies or complaints.

Keywords- Real time notification, Biometric identification, IoT, Mobile applications, Smart cities

I. INTRODUCTION

Children's security has always been a priority problem whose solution must constantly be improved. The Smart Cities paradigm clearly takes into account the need of providing a more favourable environment for children's living and learning, but focusing on this aspect it has also to deal with challenges due to cities complex environments, e.g. many construction sites, a large number of running vehicles, crowded meeting places and complex personnel structures. Such an environment indeed is generally lacking of safety conditions for children, which are inherently curious, active, and unaware (or incautious) of surrounding dangers. According to the incomplete statistics of news reports, the school-age children security accidents in recent years can be classified into four types: 34.7% of accidents happening outside the schools, 11.7% of children's misconnections, 29.8% of school bus driver's carelessness and 23.8% of children's losses.

Safety oriented projects are addressed to use ICT services to build secure ways of reducing accidents probability. For parents the safety of their children is vital and a low cost technology may give a big contribution to improve it. L'Aquila municipality is moving in that direction, exploiting University innovative researches, trying to offer a more efficient service aimed to solve children's security issues. One line of experimentation is related to the monitoring of child's movements through a system involving both GPS (Global Positioning System) and RFID (Radio Frequency Identification) technologies. The first solution is exploited for school buses localization, while the second to gather information about children's entering and exiting the school bus. This paper is especially focused on children's movements from home to school entrance, trying to solve a little part of the school-age children's security problem. A possible categorization of security system for children is displayed. During the past few years, in the area of wireless communications and networking, a novel paradigm named the Internet of Things (IoT) which was first introduced by Kevin Ashton in the year 1998, has gained increasing attention both in the academia and industry. In recent times, researchers have used the term "Internet of Things" to refer to the general idea of things, especially everyday objects that are readable, recognizable, addressable, and/or controllable via the Internet, whether via Fingerprint, wireless LAN (Local Area Network), WAN (Wide Area Network), or other means. Combining different developments will build an "Internet of Things" that enables interaction of intelligent systems with the real world. Based on IoT, Fingerprint, and cloud computing technologies, our project is designed to guarantee the children security protection, focusing on the security on the school route category. We built a system that uses such types of information to alert parents when their child is moving by school bus. The system generates alert, managed by a backend system, when the child enters and exits the school bus. The same mechanisms followed when the child leaves the school, taking the school bus and approaching home. With this information the system can inform parents about their child's movements and definitely his security. In this paper we only present the children tracking process while they are in the school bus, indeed the children's movements prior to entering and after exiting the school bus is not covered. Nevertheless, the same

monitoring solution can be exploited for children's entering and exiting the school, allowing for a better safety check. It is worth noting that the chosen technology is also dependent on the idea of maintaining as low as possible the overall costs in order to make the solution affordable for municipalities and parents.

II. LITERATURE REVIEW

The reviews from different papers are taken and studied. A some of them are given below:

1. IOT based smart school bus monitoring and notification system by Judy Thyparampil Raj and JairamSankar in 978-1-5386-2175-2/17\$31.00©2017 IEEE.

In this system, the use of RFID and GPS technologies and connect them to a remote server over Wi-Fi using an ESP8266 microcontroller. An Ublox 6M GPS module is used to find the current geographic coordinates of the vehicle's location as well as the speed it is going at. An MFRC522 RFID reader identifies each student as they board or alight the vehicle by reading the id from their RFID tags. The system uses the ESP8266 to upload the information from the peripherals to a database in the web server. The information can be accessed by the parents through a mobile application and this helps them track their wards effectively.

2. IOT BASED SCHOOL BUS TRACKING AND ARRIVAL TIME PREDICTION by Majd Ghareeb, Athar Ghamlous, Hawraa Hamdan in 978-1-5090-6011-5/17\$31.00 ©2017 IEEE

This paper presents the development of a school bus monitoring system, capable of providing productive services through emerging technologies like Internet of Things (Iota). The proposed IOT based system tracks students in a school bus using a combination of RFID/GPS/GSM/GPRS technologies. In addition to the tracking, a prediction algorithm is implemented for computation of the arrival time of a school-bus.

3. SMART BUS: A TRACKING SYSTEM FOR SCHOOL BUSES by Jisha R.C, Aiswarya Jyothindranath, Sajitha Kumary L in 978-1-5090-6367-3/17\$31.00 ©2017 IEEE

In this paper present a mobile and web application that is designed to address this issue. The system will help parents, the school and the bus to communicate automatically and easily via the application in order to detect kids' arrival time. The bus application side will notify parents few minutes before its approaching to their home. Furthermore, the system will allow parents to inform the school and hence the bus

application side about the absence of their kid. The system has been efficiently and dynamically designed and implemented so it can be hosted and used by any school administration without the need to any major modifications.

4. A Review: Real Time School Bus Security System with Biometrics, GPS and GPRS using ARM Controller in International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 4, Issue 4, April 2015

The paper describes the system which gives real time notifications about location of child using GPS. Biometric identification method is used for identification of the child. Existing system uses 89c51series controller and has limitations. This paper proposes new system design using ARMSTM32 controller which overcomes the limitation of existing system and gives better performance and reliability. New system also gives facilities like USB connectivity and self-error checking capability.

5. Experiences from an application for safe transport to and from school by Åsa Viklund and Katarina Appeltofft in 978-1-61284-671-2/11/\$26.00 ©2011 IEEE .

This system will handle, safe route planning, rerouting of routes, school bus position tracking and monitoring, safety enhancement applications for bus drivers, warning systems for surrounding vehicles and training schemes for school bus drivers. The evaluation will focus on usefulness, effectiveness, acceptance in a user perspective. In addition socio-economic analysis will be done.

III. OVERALL ANALYSIS OF REPORTED WORK

In the above references, there are some parameters that are not yet monitored such as driver alcohol detection system, driver wearing seat belt or not, finger print identification. Researchers want observed data to be readily available for research purpose as well as monitor the authentic time changes in various parameters. There are some research papers which monitors one or two parameters in one system. But the proposed paper will be able to monitor all these parameters in one system. In this project we built a system that uses such types of information to alert parents when their child is moving by school bus. The system generates alert, managed by a backend system, when the child enters and exits the school bus. In this project we can monitor the real time parameters and update the status through internet and will be available using Android application.

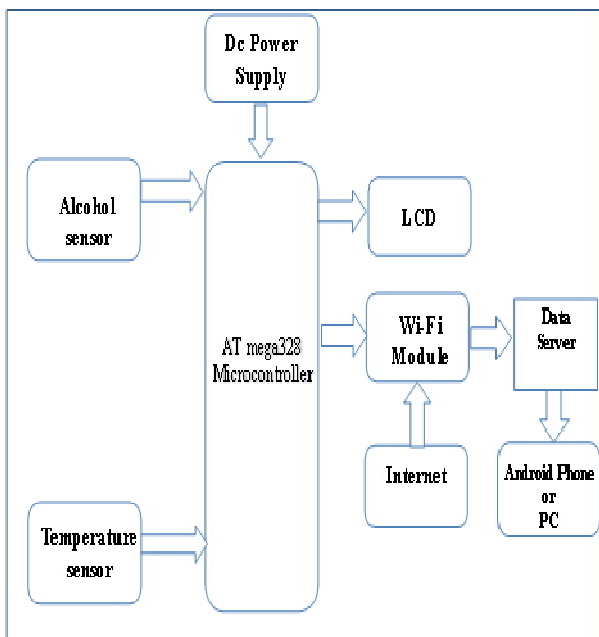


Fig.1: Block Diagram Of Smart School Bus Monitoring and Notification System

In this block diagram consists of ATMEGA328 microcontroller, Alcohol sensor, Temperature sensor, LCD display, DC power supply and ESP8266 Wi-Fi module. The block diagram of smart school bus monitoring system is shown in above figure 1.

A. Microcontroller:

- ATmega328: Microcontroller can be termed as a single on chip computer which includes number of peripherals like RAM, EEPROM, Timers etc., required to perform some predefined task. In this system microcontroller used for programming and to control input and output hardware.
- ESP8266 Wi-Fi Module: Your ESP8266 is an impressive, low cost Wi-Fi module suitable for adding Wi-Fi functionality to an existing microcontroller project via a UART serial connection. The module can even be reprogrammed to act as a standalone wi-fi connected device.

B. Alcohol sensor:

This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common Breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration.

C. Temperature sensor:

A temperature sensor is a device that detects and measures hotness and coolness and converts it into an electrical signal. It will detect inside temperature of bus.

IV. RESULT

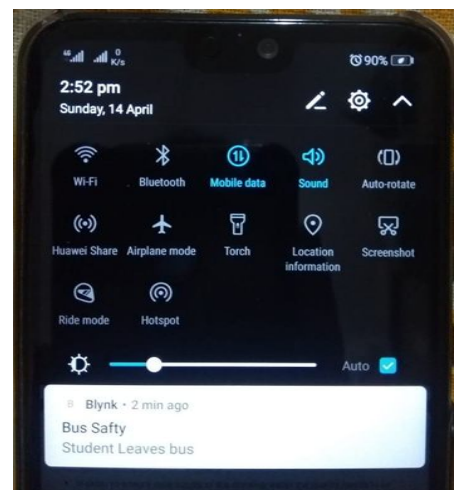
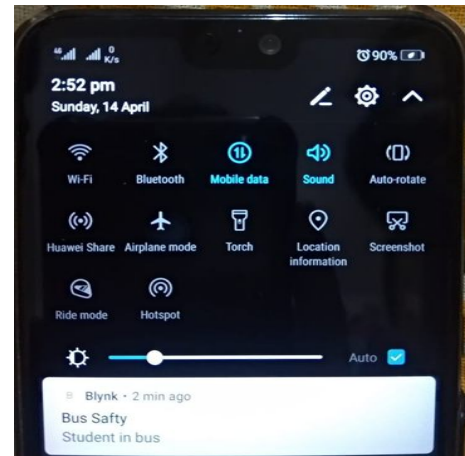


Fig.2: Parent Message Notification

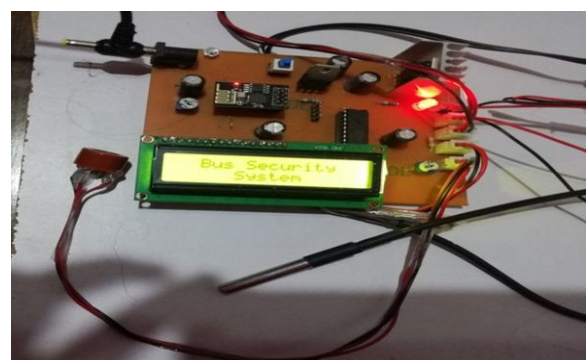


Fig.3: Monitoring the parameters

V. DISCUSSION

The completed system will meet all the specifications and provides all the functionalities identified in the design phase. Using this system, the parents can easily track the school bus moving at safe speeds, inside temperature of bus, driver wearing seat belt and alcohol detection. Ensure safe arrival and departure of students. Enhancing education system could be done not only by targeting the process of education itself, but also by providing the most possible comfort for student and parents to increase their interest in school. The idea of this project was to target this issue, in which a tracking system for the school bus was designed and developed using a software application (android and web). The system is totally managed by the school which puts less cost and more information security. A possible improvement that could be added to the application is to use notifications rather than sending SMS since it is cheaper.

VI. CONCLUSION

Proposed system will overcome the limitations such as with memory, cost of system, performance, power consumption, reliability, compactness and good look. With such system parents can know route of bus, location of bus and pick drop point of their children status, without any trouble. Hence need of such system in modern busy life is very essential.

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