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Students Safety with Parents, Driver and Management Alerting System using Cloud Technology

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Abstract: ***Main objective of proposed system is to develop a cloud based smart system for school bus/vehicles that track and monitor the student entering in to the bus and by using cloud computing, alert their parents and school administration about student entering or leaving school bus as well as about any emergency occurs. As all know that in today's fast lifestyle parents don't have more time to drop and pick their children at bus stop or school. There are number of problem occur in the society about safe transportation of children from home to school and vice versa. Parents have always tension about transportation through buses/vehicle. To avoid this problem this system is proposed. Main aim is to develop a system which is beneficial for society, reduce waiting time on the bus stop, reduce crime against student and increase the safe transportation of student from home to school and vice versa. System monitors every student get entered into the school bus. The proposed system will be definitely helpful for real time tracking of school bus. Cloud based system is designed that is configured with Raspberry Pi IOT module for fast processing and data access. This module has to be attached to every bus to capture the real time data. And the data from many buses are well managed by ThingSpeak cloud from MATHWORK. Monitoring and alerting through cloud computing.***

Index Terms- Students Safety, IOT, ThingSpeak, GPS, GSM, RFID

I. INTRODUCTION

In today's fast style parents don't have time to drop their children at school. Everyday almost all the students need to move from home to school and vice versa through somewhat means of vehicles. To obtain safe transport of children is critical issue for their parents. The major problem about the school bus is the parents waiting for longtime for arrival of school bus on bus stop. To obtain the security by knowing the current location of bus in case of emergency like traffic jams and abnormal whether condition is essential for parents.

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The numbers of existing systems are based on GPS tacking and monitoring the location of vehicle/bus on the Google map or sending SMS about location of vehicle to the owner of vehicle, but it requires continuous observation on Google map or on specific mobile apps. To overcome all this problem, smart tracking, monitoring and alerting system for school bus is proposed. Proposed system mainly focuses on the alerting to the parents or management in case of emergency or late approaching to school or home. The system is based on the Raspberry pi IOT microcontroller, GPS receiver, GSM module, RFID reader and passive RFID tag. Raspberry pi IOT is heart of system which will process the functioning of total system. In proposed system the tracking of school bus and monitoring student is done by GPS & RFID technology respectively and alerting to their parents and school administration is done by sending SMS about bus location and student status in the bus by using the GSM module. The goal of our system is to alert the parent just few minutes before arrival of bus to its particular stop, thus saving of their precious time by avoiding long wait for bus. To handle 1000s of such buses or vehicle, cloud based system is proposed. The data storage of proposed IOT modules is on cloud and through it only alerting is provided. Sample system is installed at Godavari School buses at Jalgaon. By undergoing this system, parents observed the sense of security by knowing the current location of bus in case of traffic jam.

In 2012, V. Venkatakrishnan et. al. developed ticketing and monitoring system for Public transportation that included ZIGBEE, GPS, RFID and GSM for integration of system. For ticketing, RFID was used and for counting entries and exits, IR sensors were used [1]. Another one system called Smart on board public information system was fixed GPS, GSM/GPRS and microcontroller module on bus. Information about present and next station was informed by comparing the GPS information and scheduled coordinates on display on bus stand. Ideal time of vehicle is decreased and was reported by central office [2]. Abid Khan et. al. had proposed the tracking system using GPS and GSM. Single board embedded system was used with GPS and GSM. The vehicle location was reported by SMS message. The main advantage of the system was totally integrated so that once it was implemented on vehicle then it is easy to track vehicle at any time [3].

The intelligent bus systems develop for campus bus identification monitoring and management system using RFID and sensing technologies. The system reduces manpower significantly. Bus drivers would also be more punctual to the bus schedules that have been established.

The integrated technology used in the system was suitable to monitor and manage vehicle transportation system [4]. In 2013, J. Saranya et.al. proposed the system which focused on implementing children tracking system on android terminal for every child attending in the school. Child's movements were tracked in and out of school was possible using this system.

The administration and parents were alerted accordingly. Crying of children in the school bus is reported by voice recognition system and information is sent to their parents [5].

Another work was focused on the real time bus monitoring and passenger information. The system used link updater locates the bus position along the current route of the bus. The link updater then calculated the time required to reach the end of the current link and updated the estimated end time information in the bus position table. The estimated time for arrival was reported to control room and displayed on display board at bus stops [6]. In 2014, R. Maruthi and C. Jayakumari developed SMS based bus tracking system using open source Technologies. The WAMP server fetched the location name from the database for the corresponding vehicle and sent a reply to the user using SMS. The system was useful for all passengers to board the bus by knowing the location of the bus through SMS [7].

Recently Global navigation satellite system (GNSS) [8] was system of satellite user for positioning and tracking. The main objective of this system was to reduce the waiting time of passenger in bus stop by sending locations to the passenger through SMS. Real time location of bus was displayed on Google maps by using GNSS based web application with speed. GNSS and web technologies were combined the aspects as Google map, web browser and internet for best cost bus monitoring [8].

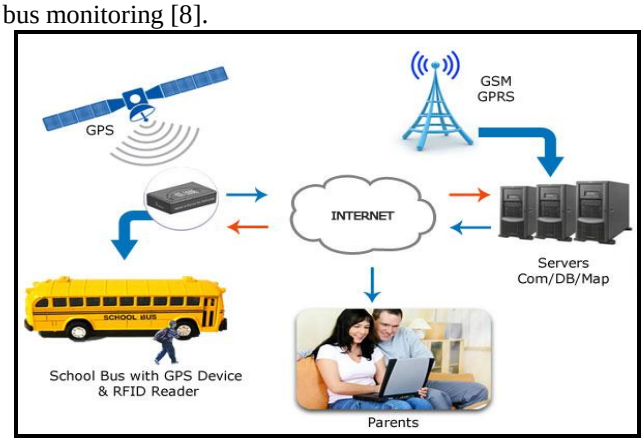


Figure 1: Block diagram of GNSS [8] based Bus Monitoring System

Based on the comprehensive survey of resent technologies, it is observed that all the systems require continuous monitoring. Alerting is rarely presented. It is observed that new proposed system should be more accurate, reliable and processing should be fast and easily accessible through means of specific app or web access. Existing systems are based on the GPS tracking and monitoring the location of vehicle on the Google map or sending SMS about location of vehicle to the owner of vehicle. The existing systems are only for personal vehicle, car and cargo trucks. The existing systems are having small area of application.

II. METHODOLOGY

The present system is specially proposed for school buses. In present system is tracking of school bus and monitoring of student is done by GPS and RFID technology and alert their parents and school administration by sending SMS using GSM module. GSM is suitable as compared with Internet to send message immediately. The cost of GSM module is less, sends SMS on mobile immediately and every parent is having mobile with them at any time, so GSM is more beneficial as compared to internet. RFID technologies together with GPS and GSM with RASPBERRY PI IOT microcontroller are suitable to be implemented in the school bus monitoring system. In case of any emergency or tedious late mark for particular vehicle is observed into the stored cloud data by using MATLAB cloud computing system, then high alert will be given to the parents or management to avoid any further problems.

III. PROPOSED SYSTEM DESCRIPTION

The system is basically fully automatic for school bus tracking and monitoring of student and alerting their parents and school administration. The system consists of RASPBERRY PI IOT microcontroller (Raspberry pi board), GPS receiver, GSM/GPRS module, RFID tag, RFID reader and LCD output display.

In this system, GPS receiver is used to take the real time location of school bus. Location is compared with location saved in database, if location is match with received location microcontroller process the location and sends alert SMS to student parents of upcoming stop using GSM module about school bus location. At bus stop, student entering in the school bus is having RFID tag as identity card. Every student is having unique RFID tag number. RFID reader is monitoring the entry of students in school bus and send signal to microcontroller. Microcontroller is process the signal and sends SMS to parents and school administration about student is entering on not in to the school bus. Essential information is displayed on output display. Overall Architecture of the proposed system and System block diagram is shown in Figure 2.

A RASPBERRY PI IOT microcontroller is central processing unit of this system which is interfaced with the RFID reader, GPS receiver, GSM/GPRS module and display. The operating System Boots from SD card and a version running on the Linux operating system. RASPBERRY PI IOT monitors the whole functioning of the system.

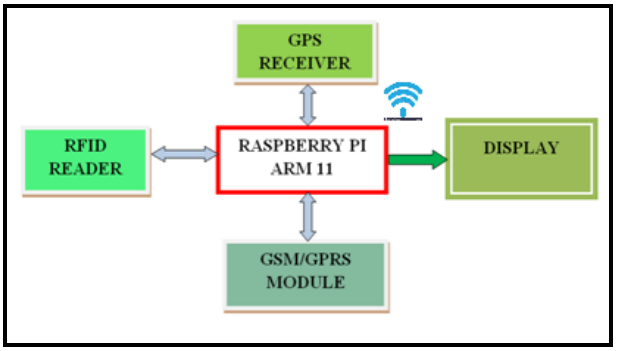


Figure 2: System Block Diagram

The Global Positioning System is the only fully functional Global Navigation System. In order for a GPS to work, it must lock on the nearest 4 satellites to determine its location. GPS receiver is used for real time location tracking of school bus for smart tracking system. GPS receiver tracks the position, speed, time, date, elevation, number of satellite in real time. Real time location tracking of bus is most helpful in critical issue like traffic jam.

Monitoring and identifying of student is main and essential part of the system. RFID is technology by which digital data can be encoded in an RFID Tag and is read by using RFID reader. The reader is has an attached antenna. It captures data from tags and then passes it to a processing unit. Student monitoring at bus stop and school is done with the help of RFID Reader and Passive RFID tag. Passive RFID tag acts as identity card of student.

Every student has unique tag (card) number. RFID reader monitors entry/exit of student into the bus at bus stop or school. Monitoring of student provides the security for school bus student using our system.

GSM module is used for sending alert SMS to parent of student and school administration. A GSM modem accesses a mobile operator's SIM card. Global System for Mobile Communication can send SMS all over the country immediately. GSM module is operates on AT command. AT commands are recognizable by GSM Module. They are used to communicate via a serial interface with the GSM subsystems. GSM is more beneficial for sending alert SMS to parent as compare with internet facility.

LCD output display is interfaced with Raspberry pi board for the Graphical User Interface. The output of may be display on LCD through HDMI connection. The HDMI connector is used to connect monitor to Raspberry pi board. The output is also being seen on computer/laptop with the help of remote connection with Raspberry pi using SSH connector Putty and Xming. LCD displays the sequences of operation perform by the system.

Algorithms for the proposed system is given as-

RASPBERRY PI IOT board is embedded with the python program to handle the system dedicatedly for specific purpose.

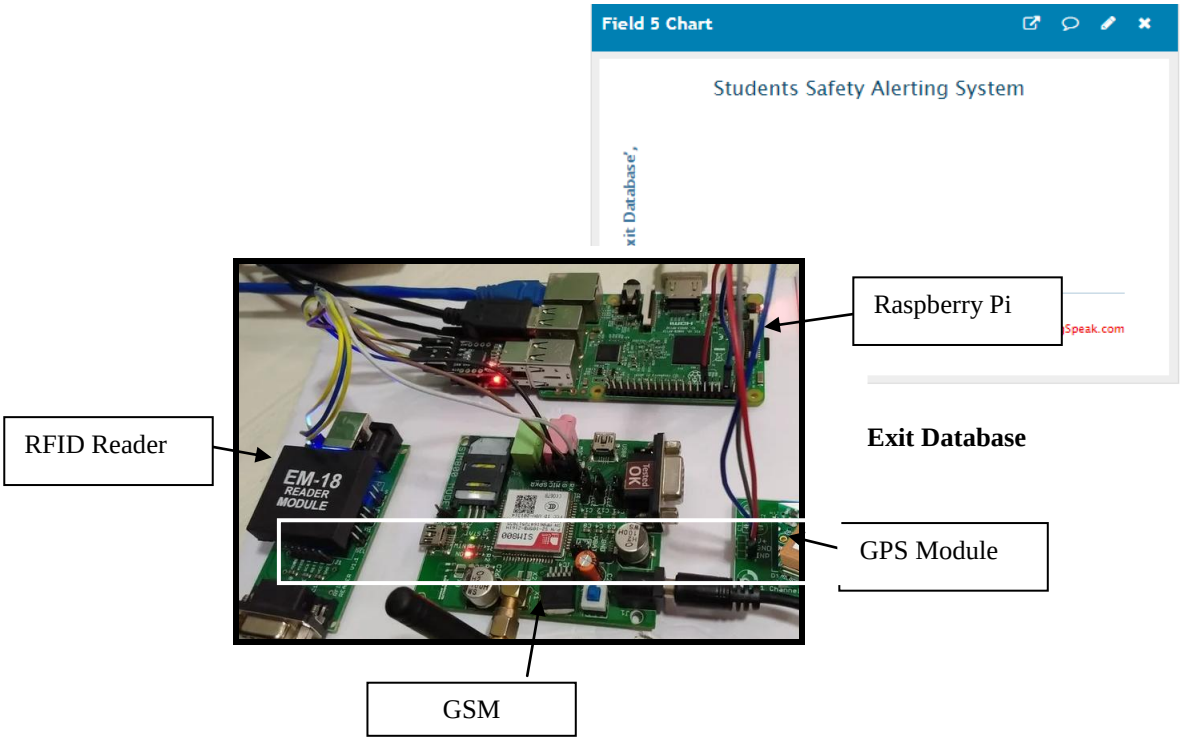
Algorithmic steps of python code are as follows.

1) Initialize the system.
2) Store the initialization time, date and vehicle number on cloud in 'Initialization database' and in its temporary memory.
3) Gives long beep for indication initialization for ready to enter the student into the bus.
4) Scan the RFID card of each students entering. Same time counting is done using IR sensors attached for tally purpose.
5) If not tally, it gives alert to driver.
6) If tally, stores all the data on cloud in 'In Database' and its memory both.
7) Time stamp of all the students is available on cloud in 'TimeStamp Database1'. It downloads the time stamp database for particular vehicle and compares the real time with the specified time stamp. If time stamps reaches for particular student, message is send to the student's parent.
8) At the particular bus stop, student's id card is scanned and student is allowed to go down the bus.
9) It modifies the 'Exit Database'.
10) When bus is empty, the driver has to press exit button on the system. System internally compares the in data and out data. The request is also send to cloud for the same.
11) If any difference found, system gets alert by system or from cloud.
12) Cloud is provided with specific path for bus route in 'Route database'.
13) If any diversion in bus is recorded by system or cloud and/or if any big breakdown is recorded by the system/cloud then the alert is given to the driver, parents and management.
14) Alert is given in continuous mode until the reply is given by authenticate person for solving the problem.
15) If no high alert found, system exits.
16) The steps 1) to step 14) repeats for next turn.
17) The steps 1) to step 14) repeats for next turn if bus moves towards bus only the time stamp from database 'TimeStamp Database2' is downloaded in step 7.

Hardware system is responsible for sending the data to ThingSpeak cloud and high alert if any in emergency is identified by cloud data analysis using MATLAB interface to cloud data as cloud computing gateway.

The algorithmic steps for the MATLAB computing are given as follows. The various databases has to be created for storage of various data on ThinkSpeak cloud like 'Initialization Database', 'In Database', 'TimeStamp Database1', 'TimeStamp Database2', 'Exit Database', 'scheduled Database' and 'Route Database'.

1. It initializes all the databases.
2. Checks the initialization time, date and vehicle number on cloud in 'Initialization database' and compare with its 'scheduled Database'. If not scheduled, sends alert to driver module and administrator.
3. Checks tally data, from 'In Database', if not tally, it sends alert to management and driver.
4. If requested by the particular bus module, its 'TimeStamp Database1' is selected and sends to that module.
5. When request for exit is send by driver, it checks the 'Exit Database'. If all entries in 'In database' and 'Exit Database' are not same, then sends alert to driver or management.
6. If no difference found, no alert is send.
7. Checks 'Route Database' with the data 'TempRoute database' when bus is on the route.
8. If any diversion in bus is recorded by cloud and/or if any big breakdown is recorded by the cloud (high alert) then the alert is given to the driver, all the parents and management.
9. If no high alert found, sends allow message to driver module to shut down the system.
10. The steps 1) to step 9) repeat for next turn.
11. The steps 1) to step 9) repeats for next turn if bus moves towards bus only the time stamp from database 'TimeStamp Database2' is send to driver module in step 4.



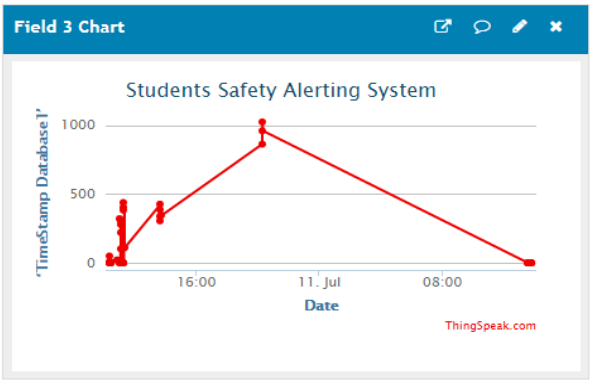


Figure 4.a. TimeStamp Database1

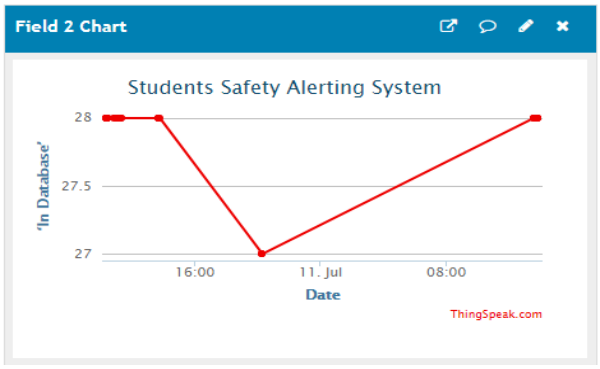


Figure 4.b. In-database

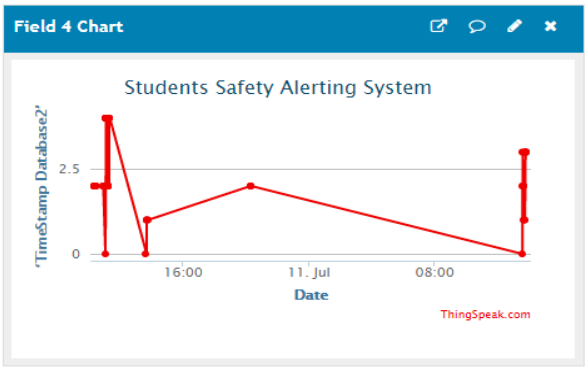


Figure 4.d. TimeStamp Database2

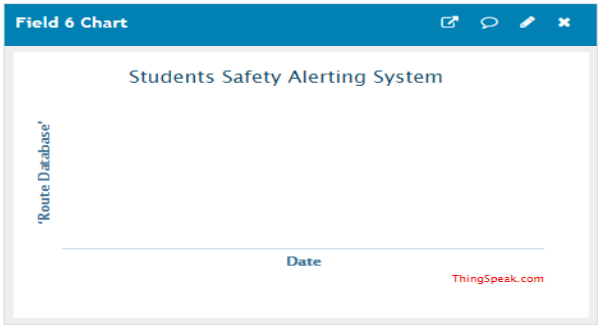


Figure 4.e. Route Database

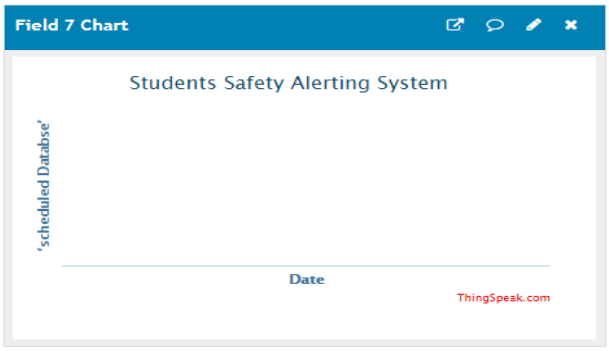


Figure 4.f. Schedule Database

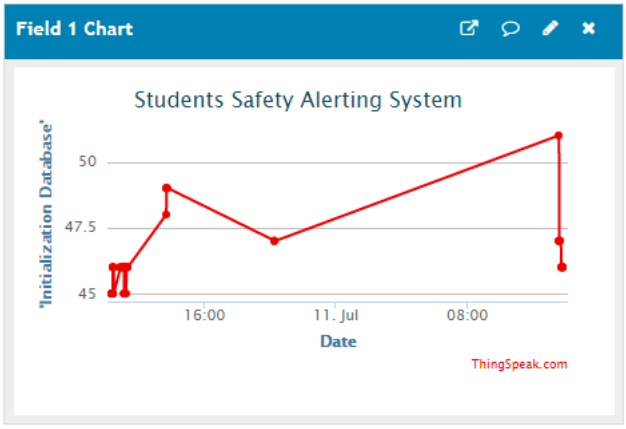


Figure 4.g. Initialization Database

IV. RESULTS

The system implemented is as shown in following Figure 3 that is to be attached to every vehicle. Vehicle must be have WIFI connected internet for cloud access to store real time data.

The ThingSpeak cloud data storage is as shown in Following Figure 4 a-g. The SMS alert will be directly given by MATLAB system through software SMS pack in case of any emergency observes.

V. CONCLUSION

The proposed system named "Students Safety with Parents and Management Alerting System using Cloud Computing" has been successfully designed and tested. It has been developed by integrating features of all the hardware component and software used. All modules are properly configured contributing best performance. Secondly, using advanced RASPBERRY PI IOT board and cloud computing like growing technology the system has been successfully implemented and tested.

REFERENCES

1. V. Venkatakrishnan, R, Seethalakshmi, "Public transport ticketing and monitoring system," Journal of Theoretical and Applied Information Technology, Vol. 38, No.1, April 2012.
2. Prafill D, Patinge, N.R. Kolhare, " Smart onboard public information system using GPS and GSM integration for public transport," International Journal of Advanced Research in Computer and Communication Engineering, Vol.1, Issue V, July 2012.
3. Abid Khan, Ravi Mishra, "GPS-GSM based tracking system," International Journal of Engineering Trends and Technology," Vol. 3, Issue 2, pp: 161-164, 2012.
4. M. A. Hannan, A. M. Mustapha, A. Hussain, H. Basri, " Intelligent bus monitoring and management system," Proceeding of the World Congress on Engineering and Computer Science, Vol. II, October 24-26, 2012.
5. J. Saranya, J. Selvakumar, "Implementation of children tracking system on android mobile terminals," International Conference on Communication and Signal Processing, April 3-5, 2013.
6. Swati Chandurkar, Sneha Mugade, Sanjana Sinha, Pooja Borkar, "Implementation of real time bus monitoring and passenger information system," International Journal of Scientific and Research Publications, Vol. 3, Issue 5, May 2013.
7. R. Maruthi, C. Jayakumari, "SMS based bus tracking system using open source technologies," International Journal of Computer Application, Volume 86-No 9, January 2014.
8. A. Kannaki, Vasantha Azhagu, N. Vijayalashmy, V. Yamuna, G. Rupavani, " GNSS based bus monitoring and sending SMS to the passengers," International Journal of Innovative Research in Computer and Application Engineering, Vol. 2, Special Issue 1, March 2014.

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