RESEARCHERID
THOMSON REUTERS

[Kumar, 5(12): December2018]
DOI- 10.5281/zenodo.1884228

ISSN 2348 – 8034
Impact Factor- 5.070

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

IOT BASED TRACKING AND MONITORING SYSTEM FOR SCHOOL CHILDREN SAFETY

D. Lokesh Sai Kumar[*1], B. Vishnu Vardhan[2] & A. Yuva Krishna[3]
[*1,2&3]Asst. Professor, Dept of CSE, P.V.P. Siddhartha Institute of Technology, Vijayawada

Abstract

In this paper a system for child safety is proposed using IOT technologies.The purpose of this system is to monitor the daily routines of children with ease.The focus in mainly on the daily transit of children from home to school and back to home, assuming the use of school bus.IOT paradigm is exploited together with different localization techniques i.e, RFID, GPS and GSM.In this paper the applicability of RFID and GPS technology efficient tracking capabilities is usedfor children's tracking and monitoring during their trip to and from school by school bus.The GSM mobile communication is used for children's tracking and monitoring beyond the school and home environment. The focus of this project is to have an alert based communication medium between children and the concerned persons like school authorities, parents, bus staff, etc.,The SOS alert is raised about the particular child whenever he/she is out of the school/school bus environment. Hence this project is aimed at providing a sense of security of school going children in today's time.

I. INTRODUCTION

The motivation for this system comes from the increasing crime against children in the past years, as there are scenarios of the child getting lost/kidnapped in the major crowded areas[1]. This paper focuses on the key aspect that lost children can be traced with the help of the people around the child and can play a significant role in the child's safety until reunited with the parents. The Smart Cities paradigm clearly takes into account the need of providing a more secure environment for children's living, playing and learning, but focusing on this aspect it has also to deal with challenges due to city complex environments, e.g. many construction sites, a large number of running vehicles, crowded meeting places and complex personal structures. Such an environment indeed is generally lacking of safety conditions for children, which are inherently curious, active, and unaware of surrounding dangers.

There are many ways to solve children's security issues. One of the them is related to the monitoring of child's movements through a system involving both GPS(Global Positioning System), RFID(Radio Frequency Identification) and GSM technologies[2]. The first solution is exploited for school buses localization, while the second to gather about children's entering and exiting the school bus and the third is to have a communication system between the parent and child. This paper mainly focuses on children's movements from home to school entrance.

Introduction to IOT

The Internet of Things System (loT) refers to the set of devices and systems that stay interconnected with real-world sensors and actuators to the Internet[2]. loT includes many different systems like smart phones, cars, hand-held devices and even human implanted devices, home automation systems and lighting controls; smartphones which are increasingly being used to measure the world around them. Similarly, wireless sensor networks that measure weather, flood defences, tides and more. There are two key aspects to the loT: the devices themselves and the server-side architecture that supports them. The motivation for this wearable comes from the increasing need for safety of little children.

Combining different development will build an "Internet of Things" that enables interaction of intelligent systems with the real world[3-4]. Based onIoT, RFID, Cloud Computing and GSM technologies, this project guarantee the children security protection, focusing on the security of school going children.

This system uses such types of information to alert parents when their child is moving by school bus. The system generates alert, when the child enters and leaves the school bus. The same procedure is followed when the child leaves the school, taking the school bus and approaching home[5]. In this paper we present the children tracking process while they are in the school bus using GPS and RFID. The children's movements prior to entering and after exiting the school bus is covered using GSM mobile communication.

II. IMPLEMENTATION

A prototype of this system is designed, implemented and tested. Testing is a very crucial part to validate the functionality of the system. It is designed to increase the likelihood of finding an error and checking the functionality of the proposed system. The units were first implemented individually and they were tested to check if they were working properly. Finally, they were integrated and configured as required for the system. The unit test was held for all the units in our system RFID reader and RFID tags, GSM modems and school server.

In this method we collect the boarding and deboarding locations of the students using the architecture below. This unit checks the children boarding the bus, getting down from the bus, send information to the parents and school authorities. When the child boards the bus, he places his RFID tag on the reader. This data is sent to the processor. At the same time the location is identified using GPS. These values are then send to the modem to forward to the parent and the school.

Figure 1: On board Unit

The various entities used in the kit are:

1. ARM7 Processor: An ARM processor is one of a family of CPUs based on the **RISC** (reduced instruction set computer) architecture developed by Advanced **RISC** Machines (ARM). The ARM7 family is a range of low-power 32-bit RISC microprocessor cores optimized for cost and power-sensitive consumer applications. The ARM7

family incorporates the Thumb 16-bit instruction set - enabling 32-bit performance at 8/16-bit system cost. It is based on reduced instruction set computing (RISC) architecture with 32 or 64 bit architecture. The 128 bit interface allows high speed operation. Embedded ICE RT and Embedded Trace interfaces allow real-time debugging and trace the execution of instructions. This collects the information from GPS and RFID send the data to gsm modem to forward to the necessary.

2. GPS (Global Positioning System):

The boarding and deboarding location of the children is identified using GPS technology. The GPS coordinates are captured and the GSM modem sends it to the parent and the authorities. GPS is a satellite navigation system which is used to determine the ground position of an object. The GPS system includes 24 satellites deployed in space above the earth's surface. They orbit the earth once every 12 hours at an extremely fast pace of roughly 11,200 kilometers per hour. Each GPS satellite broadcasts a message that includes the satellite's current position, orbit, and exact time. A GPS receiver combines the broadcasts from multiple satellites to calculate its exact position using a process called triangulation. Three satellites are required in order to determine a receiver's location, though a connection to four satellites is ideal since it provides greater accuracy. Along with these satellites and ground stations, the GPS receiver calculates the location of the students.

GPS consists of 3 segments. The space segment, control segment and user segment.

- The space segment consists of the 24 space vehicles with the satellites. They orbit the earth in 12 hours and send radio signals.
- The control segment consists of the tracking stations. They measure the ephemeris i.e., orbital data and the satellite clock corrections and send them to the satellites,sent to the receivers.
- The user segment consists of the GPS receiver which using the GPS signal calculates position, time, velocity etc.

GPS operates by a process of triangulation. Every GPS satellite transmits information about the time, and its position[3-4]. By comparing the signals received from four satellites the receiver deduce how long it has taken for the signals to arrive and from knowledge of the position of the satellites it can calculate its own position.

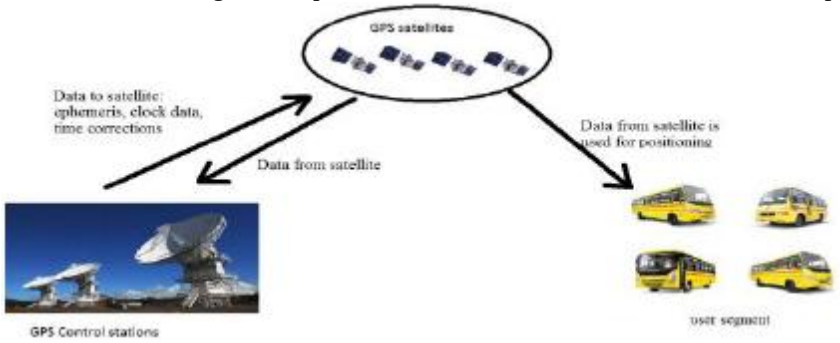


Figure 2: GPS System

3. GSM (Global System for Mobile Communications)

GSM was developed by the European Telecommunications Standards Institute (ETSI) which describes the protocols for 2G cellular networks used in mobile phones. It is operating over 219 countries and territories. GSM is implemented using narrow band time division multiple access (TDMA) and is used in various digital wireless telephony technologies[2]. The data is digitized, compressed and sent through a channel (which may have other users) during its time slot. The frequency band is 900MHz or 1800MHz. As the GSM operators are globally agreed upon, they allow the users to use their same mobile phone in different countries by changing the SIM card.

4. Radio-Frequency Identification (RFID)

This uses radio waves to read information stored in a tag attached to an object. A tag can be read from several feet away and need not be in direct line-of-sight of the reader. A RFID system has two units: a tag and a reader[2]. RFID tags contain a transmitter and a receiver, a microchip to store and process information, an antenna to receive and

transmit a signal. To read the information stored on a tag, a two-way radio transmitter-receiver called an interrogator sends a signal to the tag using an antenna which then replies with the data stored in it.

There are 2 types of RFID tags. Active and passive. Active tags has their own power supply hence can be read from several metres away. The passive tag work with the help of the radio waves generated by the reader. Hence they are small in size and have more life. In this paper we use passive RFID tags

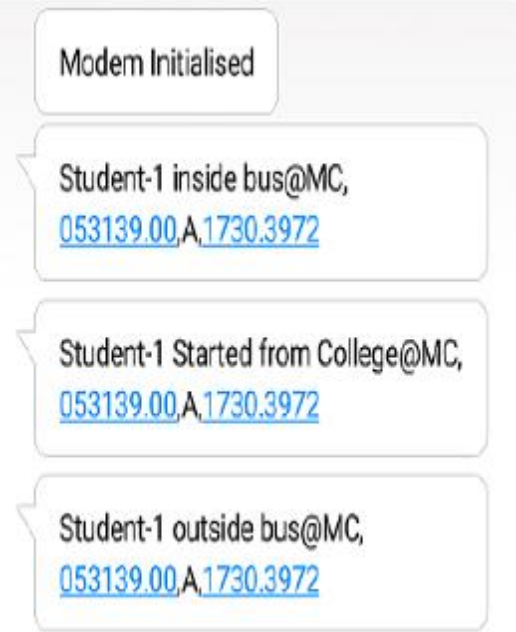
Figure 3(a) RFID Reader

(b) passive tags

III. IMPLEMENTATION RESULTS

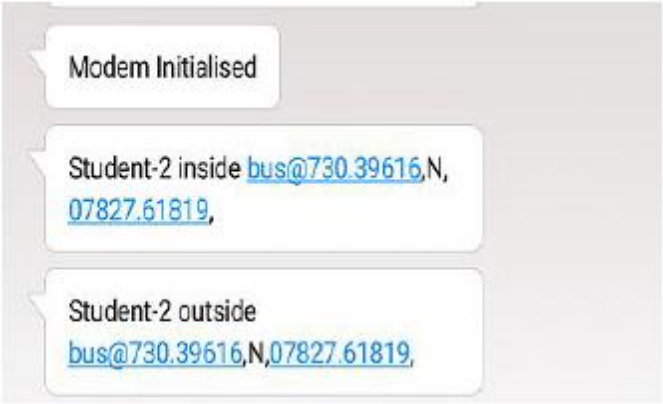
The prototype is successfully implemented and tested.
Case 1: The student boards the bus at his bus stop, reaches school, on the way back home he get downs at a place other than his bus stop.

SMS will be sent to the parent and school authorities in every case. The snap shot of the SMS is shown below.



Case 2: A student boards the bus from his bus stop and get down from the bus at a place before reaching the school. Below pictures shows the snapshot of the different stages

SMS will be sent to the parent and school authorities at each instance. The snap shot of the SMS is shown below.



The table below shows the output. The row marked in red indicates the student got down before reaching college or he got down the bus at different location before reaching home. The location details are send in sms. The below table shows an example of a particular bus route. The cell named other indicates that the child got down at a place other than college or his home.

Roll No	Place	Time	Place	Time	Received
101	Home	8:00 am	College	9:00 am	Yes
102	Home	8:10 am	College	9:00 am	Yes
103	Home	8:30 am	College	9:00 am	Yes
101	College	3:30 pm	Other	4:00 pm	Yes
102	College	3:30 pm	Home	4:10 pm	Yes
103	College	3:30 pm	Other	4:00 pm	Yes

IV. CONCLUSION

The proposed system was successfully executed. The results and graphs are shown in the above section. This unit tries to detect the students who starts from home but don't reach the college. Whenever a student gets down from the bus, a message is sent to the parent and the school informing the location obtained through the GPS unit. Parents can use the coordinates given in the message and use any map application to identify where the student is. So the parent can keep an eye on the actions of their children after leaving for the school.

REFERENCES

1. *RFID-based system for school children transportation safety enhancement 2015 IEEE 8th GCC Conference & Exhibition, 16 March 2015.*
2. *Nikitin, P. V., "Antennas and Propagation in UHF RFID Systems", University of Washington, Electrical Engineering. Available at: http://www.ee.washington.edu/faculty/nikitin_pavel/pap ers/RFID_2008.pdf*
3. *F. A. Silva, "Industrial Wireless Sensor Networks: Applications, Protocols, and Standards [Book News]," in IEEE Industrial Electronics Magazine, vol. 8, no. 4, pp. 67-68, Dec. 2014*
4. *Jun Zheng; Simplot-Ryl, D.; Bisdikian, c.; Mouftah, H.T., "The internet of things [Guest Editorial]," in Communications Magazine, IEEE , vo1.49, no.ll,pp.30-31, November 2011 doi: 10.1109/MCOM.2011.606970*

5. *Saranya, J.; Selvakumar, J., "Implementation of children tracking system on android mobile terminals," Communications and Signal Processing (ICCSP), 2013 International Conference on , vol., no., pp.961,965, 3-5 April 2013.*