ISSN (Print) : 0974-6846
Indian Journal of Science and Technology, *Vol 10(46), DOI: 10.17485/ijst/2017/v10i46/117158,* December *2017* ISSN (Online) : 0974-5645

Smart Pick and Drop Intimation System of School Children

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Abstract

Background/Objective: Due to the raise in number of kidnaps and road accidents, it is essential for the parents and school authorities to take necessary safety measures to avoid these plausible mishaps. **Methods/Statistical Analysis**: Each child is provided with a Tag for the daily bus transportation to tag on a RFID reader present in the bus. It reads the tag value and sends the information to RPi3, which is then redirected to the GPS module; it can identify the location of the bus and send the information to parent's mobile through GSM providing the location of their child accordingly. **Findings:** The bus unit used detects when a child get into/ get off the bus and this data is sent to parents through GSM and then if the parent wants to know their child's precise location, they can do it by sending "Where" message to GSM, and it returns the information. They can monitor their children through video streaming from the camera in bus. **Applications:** Student's data is also accessible to both parents and school administration to get the video streaming and children's individual information.

Keywords: Intimation, RFID, Students Information, Video Streaming

1. Introduction

In recent past, many unpleasant incidents relating to school buses have takenplace questioning the safety of children using that services.So, it's become vital for the parents to monitor their children throughout their travel. In this paper, we focus on a particular risk associated with the daily bus trip to and from school. There have been previous incidents where a child is forgotten in the bus and eventually die because of suffocation.[1,2] In this paper, the design of an efficient system is presented, which allows parents to watch over their children, their bus journey directly by providing them with location and continuous live video streaming. Every child is provided with a Tag for the daily bus transportation to tag on a RFID reader present in the bus. It reads the tag value and sends the information to RPi3, which is then redirected to the GPS module; it can identify the location of the bus and send the information to parent's mobile through GSM providing the location of their child accordingly. At any moment, if parents want to know their kid's location, they can simply send a request message as "Where" to the authorized phone number on the bus. The location of the bus at that current moment is identified by the GPS, and a message is returned to the parent's mobile providing the same along with date and time. The proposed system also provides a live video streaming option to the parents, using a sanctioned IP addresswhich also provides the student's detail database making easy even for the school administration to monitor the location of buses and children travelling in them.

2. Literature Survey

The total security for school children. Range and Obstacle detection and accident detected sensors are implanted on the front surface of the bus in order to avoid collision with another vehicle on the Road. Each student is tagged with

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unique code. Two counters used at the entrance and exit location of the bus. Wireless communication technology (IEEE 802.4.15) is used to inform the status of the bus to the school principal.[3]

They proposed another solution to solve the problem by developing a bus safety system that will control the entry and exit of students from the buses through an energy efficient methodology. His system will control the entry and exit of students to and from the bus using RFID (Radio Frequency Identification) and GSM technologies to ensure the entering and exiting of all students to and from the school bus in a safer manner.[4]

In web-based database-driven application that facilities its management and provides useful information about the children to authorized personal. A complete prototype of the proposed system was implemented and tested to validate the system functionality.[5]

GSM-GPS technology to track the children students. GPS is 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.[6]

3. System Design and Architecture

Block diagram of the proposed system is shown in Figure 1. This system uses Raspberry Pi3 as the chief module. RFID Tags are worn by the each student by which every parent can track their respective kid's current location. RFID reader used reads the Tag's value which is a 12 digit code and sends the results to RPi3 Module. GPS provides reliable positioning and timing of the children. GSM sends the information to parents accordingly. USB web camera provides live stream of students inside the bus; thisvideo monitoring and student's data information is provided to parents and school administration via IP address.

3.1 Design Requirements

This system design requires Some Hardware and Software Components those are mentioned below

3.1.1 Hardware

- Power Supply
- Raspberry Pi 3 Module.
- RFID Reader
- RFID Tags
- SIM808 Module
- USB Camera

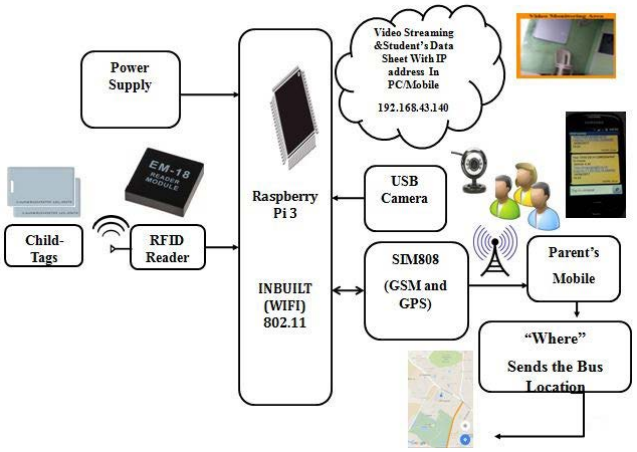

Figure 1. Block Diagram.

3.1.2 Software

- Python Programming Language
- Raspbian Based Linux Operating system

3.2 Overview of Raspberry Pi3

The proposed system is implemented using a Raspberry Pi 3 Model B shown in Figure 2. Raspberry pi is a mini computer. It is a Credit – Card Sized Computer Manufactured and Designed in the UK by the Raspberry Pi Foundation. It is capable of several things such as, spreadsheets, word-processing and high-definition videos and games. It has a Broadcom BCM2837, an ARM Cortex-A53 64bit Quad Core Processor System-on-Chip and Linux-based operating system as Raspbian and Debian. It can do multifunctional ties at a time.[7]

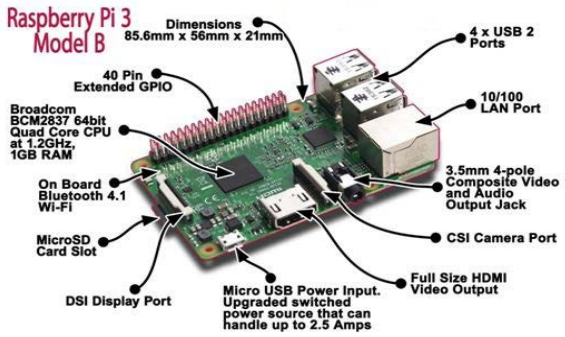

Figure 2. Raspberry Pi 3 Model B.

Features are listed below:

- 1Gb RAM
- CPU Speed:1.2GHZ
- Micro SDHC Slot
- 4USB Ports
- Wireless Connectivity(On Board): Wi-Fi (802.11n Wireless LAN) And Bluetooth Low Energy (BLE) 4.1
- Camera Serial Interface(CSI)
- Display Serial Interface(DSI)
- Micro SD Card Slot
- Video Core IV 3D graphics Core
- HDMI(High Definition Multimedia Interface) Port
- Analog Video Out: Shared with Audio Jack
- Power ratings: 800 mA
- Ethernet Port is available on Model B and B+.

3.3 RFID Readers and RFID Tags

3.3.1 RFID Readers

Radio Frequency Identification is a technology that can be use radio-frequency waves to transfer data between reader and a movable item to identify or track etc. Generally a RFID system consists of 3 arts those are: Readers, Antennas and Tags (transponders).[8] RFID Reader as Shown in Figure 3.

Figure 3. RFID Readers.

RFID Reader Module (EM - 18) Features:

- RF Transmit Frequency : 125kHZ
- Electrical Current: <50mA
- Operating Voltage : 5V
- Read Distance: 10cm
- Inbuilt Antenna

3.3.2 RFID Tags

An RFID tags are designed with a microchip contained for identifying information, and an antenna that can transmit data wirelessly to the reader. RFID Tags are shown in Figure 4.

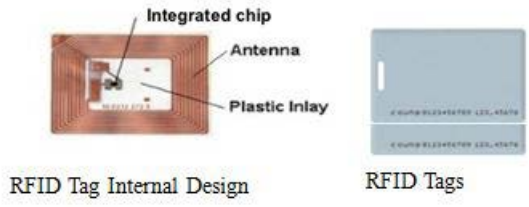

Figure 4. RFID Tags.

There are two types of RFID tags, passive and active tags. Passive RFID tags are chosen in this system, as they have a short reading range which fits our requirement to detect the child when he/she is near to the reader (i.e. when he/she get into or get off the bus). Furthermore, they are lower in prices and need almost no maintenance in comparison with active RFID tags.[9]

Features:

- Carry data on a microchip
- Tags Store data Only Bar Code
- Restricted To Identification Data Only
- Tags Also Programmed To Hold Information Of Student Data.
- RFID Tags Can Store Data UP to 2 Kb.

In this system RFID Readers and tags are using for Student Identification and reads that student tag value by reader and sends the information to Raspberry Pi module

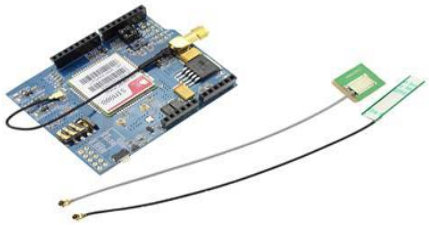

Figure 5. SIM808 Module .

3.4 SIM808 Module

SIM808 Module (Figure 5) is has been used for detecting of the location of the child's position and send the information to parent through GSM module. It is Quad-Band GSM/GPRS module; it combines GPS technique for satellite navigation. It can be integrated with GPRS and

GPS in a SMT package will significantly reduce both time and cost for user to develop GPS enabled applications. In industries interface with GPS function, it allows different assets to be followed absolute at any location time with signal coverage.[10]

Connect the USB-TTL module to the TTL UART. The hardware connection between the USB-TTL and SIM808 module is listed in Table 1.

Table 1. SIM808 Connections

USB-TTL	SIM808
GND	GND
RXD	TXD
TXD	RXD

Figure 6. USB Camera.

SIM808 Features:

- Quad-band 850/900/1800/1900MHz
- GPRS multi-slot class 12/10
- GPRS mobile station class B
- Transmitting Power:
  - Class 4 (2 W @ 850/900MHz)
  - Class 1 (1 W @ 1800/1900MHz)
- Control via AT commands (SIMCOM enhanced AT Commands)
- Supply voltage range 3.4 ~ 4.4V
- Low power consumption
- Operation temperature:-40°C ~85°C
- Power saving: Typical power consumption in sleep mode is 1 mA

3.5 Camera

This design uses a USB Camera for camera module. The camera features a high-quality CMOS sensor, with an image resolution of 25 MP (Interpolated), an adjustable lens for focus adjustment, a frame rate of 30 fps and f2.0 lens. The USB camera also is equipped with night vision for low light photography. The camera interfaces with the Raspberry Pi via the USB 2.0 port and is responsible for capturing images when requested; the pictures are captured by using the command fs webcam. The USB camera is shown in Figure 6.

This USB Camera Module is used for the capturing of the Students information video and this monitoring page information can be sent to parents through IP address.

4. Interfacing the All modules with Raspberry Pi

Interconnections and interfacings for this system are shown in Figure 7. In This Paper every student has unique tag that contains 12 digit codes specifying the child's identity. This Child tag tags on the RFID reader, it reads the tag value and sends the information to RPi3, which is then redirected to the GPS module; it can identify the location of the bus and send the information to parent's mobile through GSM providing the location of their child accordingly. At any moment, if parents want to know their kid's location, they can simply send a request message as "Where" to the authorized phone number on the bus. The location of the bus at that current moment is identified by the GPS, and a message is returned to the parent's mobile providing the same along with date and time. The proposed system also provides a live video streaming option to the parents, using a sanctioned IP addresswhich also provides the student's detail database making easy even for the school administration to monitor the location of buses and children travelling in them.

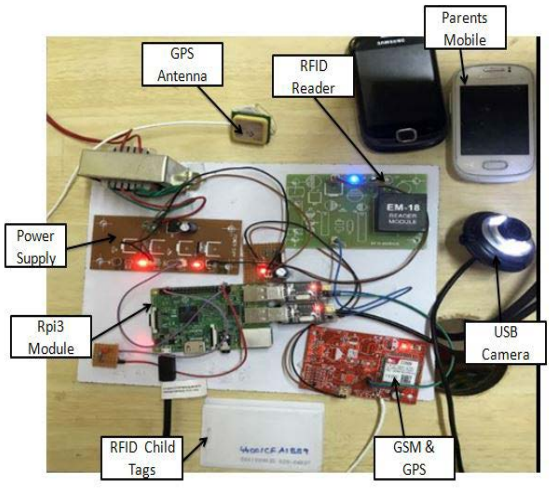

Figure 7. Interconnections of the System.

Above Figure represents the entire system interfacings with all the modulesconnecting to RPi3. Power supply is given by the micro USB power input; upgraded switched

power source that can handle up to 2.5 Amps. RPi3 40(GPIO 21) used for LED activation. GPIO 6 and 9 Pins are used for ground. USB1 can be connected to USB camera for the video monitoring of the student in the school bus.USB2 can be connected to SIM 808 Module which consists of GPS receiver and GSM Module together. USB3 can be used for receiving data from RFID reader. USB2 and USB3 are connected in TTL to serial converter can be used for Transmitting and Receiving of the data. Table 2 shows the RPi3 connections with all modules.

In this system all processes are running on python language. Video monitoring and student data information pages are designed with html.

Flow chart system is shown in Figure 8.

Table 2. RPi3 Connections with all modules

Module	Pins/USB Connection	Purpose of pin connection
Power supply (5V)	2	Power supply
LEd	40(GPIO21)	For indication
Ground	6 and 9	Ground
Reader Module	USB Rx to RFID Tx	To read the tag value
SIM808 Module (GSM&GPS)	USB Tx To SIM808 RX USB Rx To SIM808 Tx	To get the parent request To sending the messages To get the locations
USB camera	USB camera Tx to USB4 Rx	To

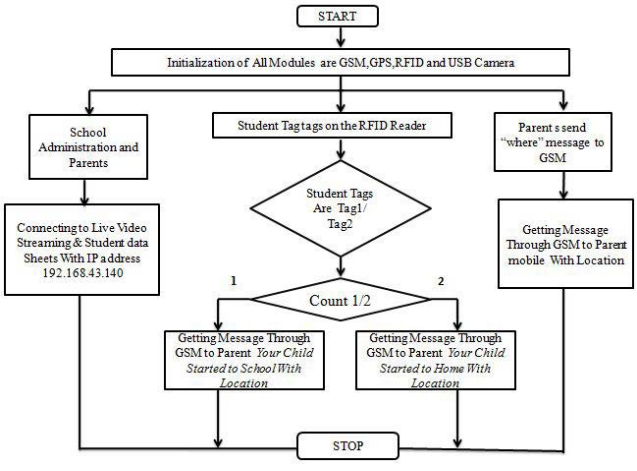

Figure 8. Flow Chart.

5. Experimental Results

The Raspberry Pi board is interfaced with the all modules; it is driven by 230V AC power supply, transferred through step-down transformer and reduced to 12V AC power further transferred through bridge rectifier and converted to 12V DC power supply. Filter capacitors are used for smoothing the waveform received from the rectifier. A Voltage regulator is a device which converts varying input voltage into a constant regulated output voltage of 5V DC. This 5V is given to all modules of this system. After that process, child tag can tag on the RFID reader; it can access the tag value and then that reading can be sent to RPi3 module. It can verify the child tag which is accessed by reader to check the child who got into or got down bus, based on the counting of the reader and get the position of the child is received by GPS receiver from SIM808 module. This result can be sent to parent's mobile through GSM. Whenever child gets into the bus parents get a message, it is shown in Figure 9. It shows child's'started to school' vehicle position with longitude and latitude values.

Figure 9. SMS of the Child get into the bus.

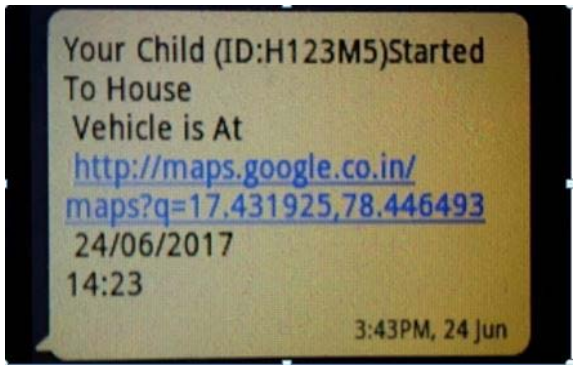

Figure 10. SMS of the Child get down the bus.

Figure 11. Parent Request Based SMS.

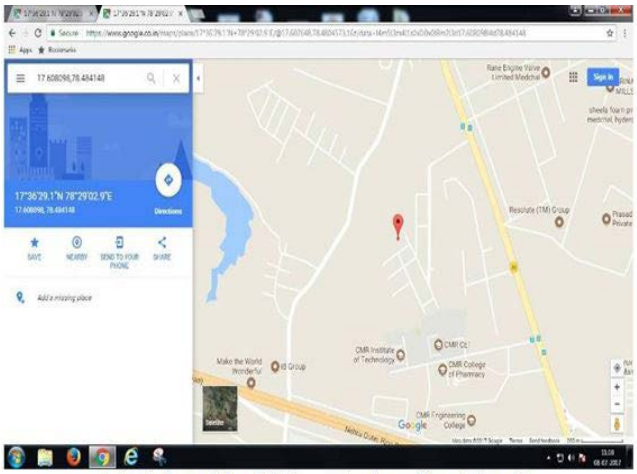

Figure 12. Location of the child position.

Figure 13. Web page with IP address.

Figure 14. Live Video Streaming in School bus.

S.no	Student Id	Student Name	Parent Information	mobile
1	M5001	student1	parent1, hillparklane Flat-no: A2, Lingampally-72	7801021539
2	M5002	student2	parent2, Flat no: D8, Eureka Court, Ameerpet, Hyderabad-32	9912277100

Figure 15. Student's data information.

Whenever child gets down the bus parents get message, shown in Figure 10. It shows child's'started to house' vehicle position with longitude and latitude values.

At any moment, if parents want to know their kid's location, they can simply send a request message as "Where" to the authorized phone number on the bus. The parent request based SMS was shown in Figure 11.

The location of the bus at that current moment is identified by the GPS, and a message is returned to the parent's mobile providing the same along with date and time Parents can view child's current position by clicking the link received in the message in Google maps. Child's position can be shown in Figure 12.

This system can also provide the information of the child's location through continuous live streaming and student's data information can be is provided in web page with Raspberry Pi's IP address. Web page is shown in Figure 13.

In that page first link is gives access to child's live streaming video, it is shown in Figure 14 and second link is gives students data information, shown in Figure 15.

6. Conclusion

The implemented system focuses on monitoring child's position and sends it to their parents respectively; it also responds to parent's requests, providing their child's current location. Parents can access student's data information and live monitoring continuously using a web page with an IP address. Implement cost is reasonable, Smart and user friendly. The security level can be extended at any place in the school, e.g. Libraries, and Classrooms. This can be made even more secure using Biometric measures, which can be used at any Educational Institutions

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