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TITLE: A SURVEY PAPER ON LOCATION TRACKING USING RFID AND IOT

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Abstract

In this paper, the Real Time Bus Tracking Application which runs on Android smart phones is proposed. People are expecting the information about the location of any kind of object for tracking purpose with the help of technological advancement of modern science. Currently, more location based services are in demand for their advancement and also to save money and time. GPS (Global Positioning System) is the system, by using it any person can get the information about their location. This system is already implemented and any person can access it without any restrictions. This will help to track the college bus to parents as well as to college management. An android device is used for the calculation of the exact location because an Android mobile phone is cost effective and offers multidimensional purposes having some extra features like GPS service. This system also send information to the parents about their ward's entry and exit from the bus. The real time system will requires the GSM module and therefore it requires SIM card. Every student will authenticated by the RFID(Radio Frequency Identification) reader. The purpose of this system is to give the exact location of bus or student's respective bus using the mobile application of the parent. It is the real time system or application, as the current location of the bus will update at every point of time in the form of longitude and latitude which is received by student's parent through the mobile application or it will be displays on LCD.

Index Terms: *Radio Frequency Identification (RFID), Internet of Things (IoT), Global Positioning System (GPS), Global System for Mobile communication (GSM) and Fingerprint authentication. etc.*
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1. INTRODUCTION

Nowadays, there is increase in number of kidnapping and road accidents cases that's the reason parents worry about their children. To track the children location in real time this paper suggests a SMS based solution.GPS module and RFID card are used which are built in the system, GPS is to track the location and other is used to identify the child.GPS is an acronym for Global Positioning System and RFID is for Radio Frequency Identification. We have used wireless communications to establish the identity of a physical object. RFID term is used to describe a system that transmits the identity of an object wirelessly, using radio waves. RFID provides wireless identification of people, books or etc. To identify the individual person's fingerprint for security purposes, the fingerprint sensors are used. A RFID tag is attached to the card which contains information about that student and is unique to each student entering the bus. The

finger print sensors contain the image of the each student's fingerprint. Whenever a student boards a bus, the RFID tag located in his/her unique identity card will be detected by the reader present in the bus. A valid fingerprint is collected and validated for further authentication of the student. A text is displayed onto the LCD display screen about the student's authentication if the fingerprint is verified. To display preset words, digits, seven segment displays as in digital clock, the flat panel LCD is used. Here the LCD displays the text which indicates the ongoing operations of the system. After successful authentication, the bus door will be opened by using a servo motor. A servo motor is used for opening and closing of the bus. In mean time a text message is also sent to the parents about the student's entry to the bus. The SMS consists of the student's name, the latitude and longitude of the current location and the time of on boarding. The SMS communication is done using the GSM module consisting of a

SIM800C chip which is a complete Quad-band GSM/GPRS solution using the Surface Mount Technology (SMT) type, embedded in the applications of the customer in order to transmit voice, SMS and data information with low power consumption. Here only text information is communicated to the parent. In this way the parents will be able to keep record of their children's location. To know the current position of the child, an android application will be provided to parents. Similarly when the child leaves the bus, RFID card of the child is verified by the reader and the fingerprint will be identified by the fingerprint sensors. This is followed by a text message that is sent to the parent specifying that his/her child has reached the destination.

2. SYSTEM ARCHITECTURE

The overall system architecture is represented in Fig. 1.
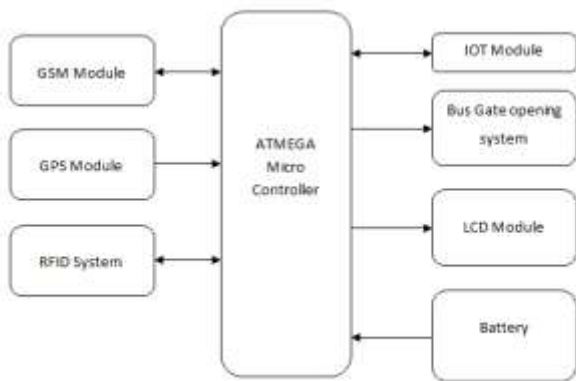

Fig-1: System architecture

RFID System, GPS Module, GSM Module, IOT Module and the LCD Display each connected to the Arduino ATMEGA-328 Microcontroller, these are the five modules of system architecture. Initially the RFID System scans the student card and detects whether the student card is valid or not and then sends the information to the ATMEGA microcontroller for further processing. The GPS Module finds the longitude and latitude of the current location and sends to the ATMEGA microcontroller and it is a one way communication from GPS to ATMEGA. The GSM module is the global system used to send SMS about the start or stop trip of the student to their parent along with the details about the current location. The IOT Module allows the microcontroller to connect to a Wi-Fi network and make simple TCP/IP connections. When a student is authenticated, the bus gate opens for the student to get into the bus. The LCD Module displays the equivalent text related to all the ongoing actions in the system.

3. SYSTEM DESIGN

The design is expressed in sufficient detail to enable all the developers to understand the underlying architecture. This deals with detailed data flow graph, use case diagrams of this system.

3.1 DATA FLOW DIAGRAM

Fig.2 shows how the data is shared from the Arduino ATMEGA-328 board and how data flows from one module to another. As shown in figure ,the modules will communicate ultimately to the Arduino ATMEGA board. The RFID reader will send the information to the Arduino about the student information , the fingerprint sensor detects the valid fingerprint of the student and communicates the same to the microcontroller. Wi-Fi module provides a portable Wi-Fi hotspot for the communication between the hardware and the mobile device and GPS module provides the information about the current location of the system. The information about all the current activities in the system is shown with the corresponding message on the LCD display.
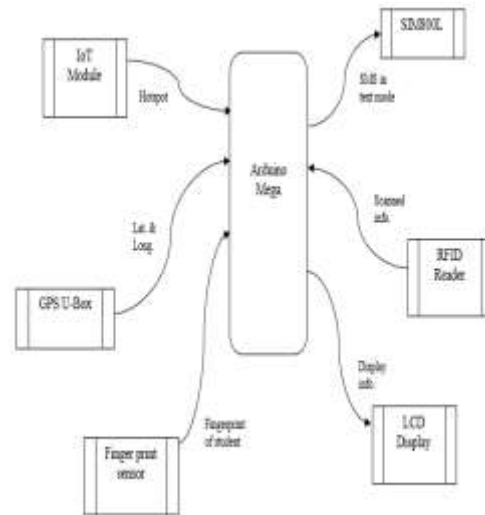
Fig-2: Data flow diagram

3.2 USE CASE DIAGRAM

Fig .3 represents the use case diagram with student and the parent as actors. Every student undergoes every process of the authentication to get into the bus. The corresponding message is displayed on the LCD Display and a SMS is sent to the respective parent. Initially the parents must have the android application in their mobile phones only then the continuous location tracking of bus is possible. The parent can monitor the exact location of the bus at any point of time during the journey. Once the student has reached the destination, a stop SMS is sent to the parent about the stop trip information which confirms that the student has reached the destination safely. The SMS about the stop trip is sent only after the successful authentication of the particular ward which is followed by the ward's exit from the bus.
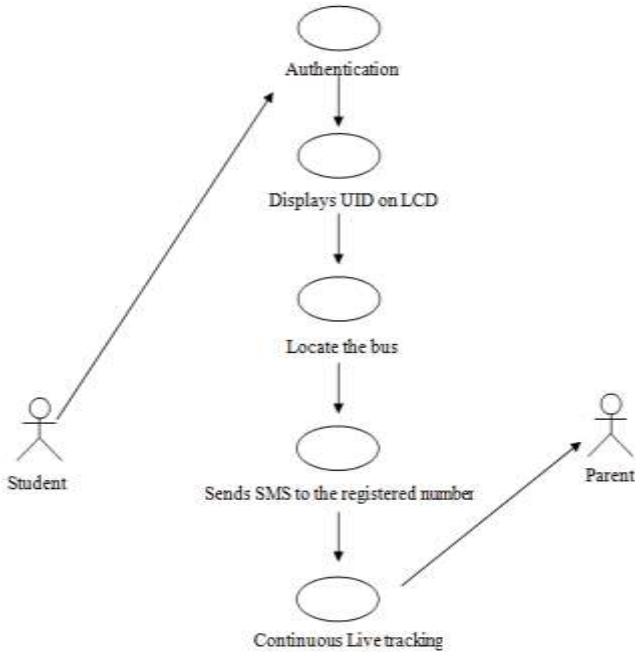
Fig-3: Use case diagram

4. IMPLIMENTATION

1.In the beginning all the modules including the GPS module, IOT module, GSM module will be initiated and the correlated initiation will be shown with the glowing of each Led light. Module initiation shows that the particular module is ready for the connection with the user.

2. RFID card will be given to each of the student who is willing to travel in the college bus. Whenever the student wants to enter the bus, his unique RFID card should be authenticated successfully. The RFID card will be automatically detected by the RFID reader and allows the student to put his valid fingerprint to the fingerprint sensor. The fingerprint sensor validates the fingerprint and indicates whether the student is authenticated and is followed by the opening of the bus gate.

3. After the successful authentication of the student, a SMS will be sent to the student's parent/guardian which consists of the student name, start or end trip of the student (start trip initially) and the latitude and longitude of the current location where the student has got into the bus.

4. When the journey starts, the parent can continuously track the bus where his/her ward is travelling with the help of an android application whose .apk file would have been communicated to the parent initially. This assures the parent about the ward's current location at any point of time.

5. When the journey ends (stop mode), the student will again be subjected to authentication by RFID reader and the fingerprint sensor. Upon successful authentication the bus gate will be opened for the student to exit from the bus and the corresponding SMS will be sent to the parent which consists of the student's name, the indication of stop trip as well as the latitude and longitude of the current location where the student has exited from the bus.
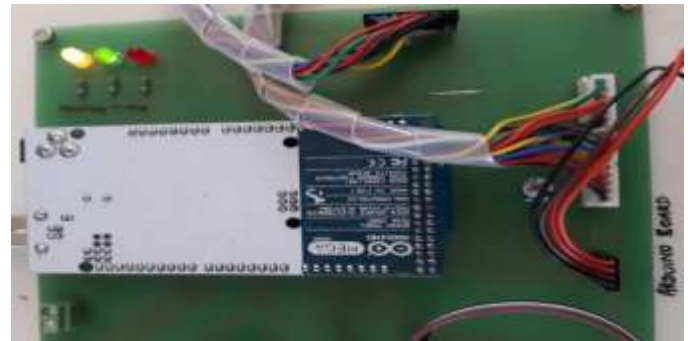
5. RESULT

The snapshots of the working of the project is shown below:
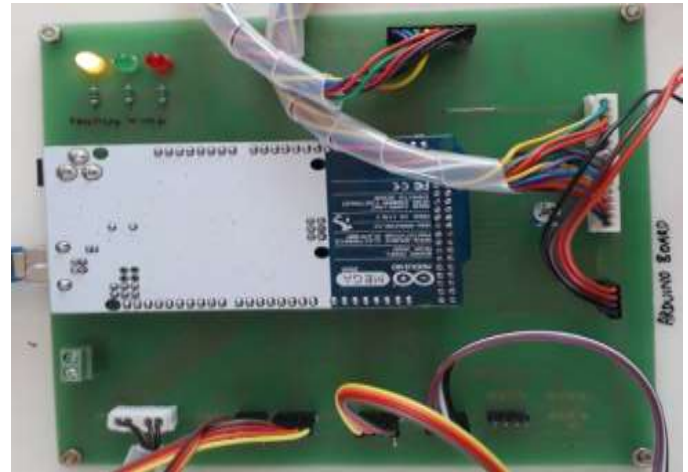
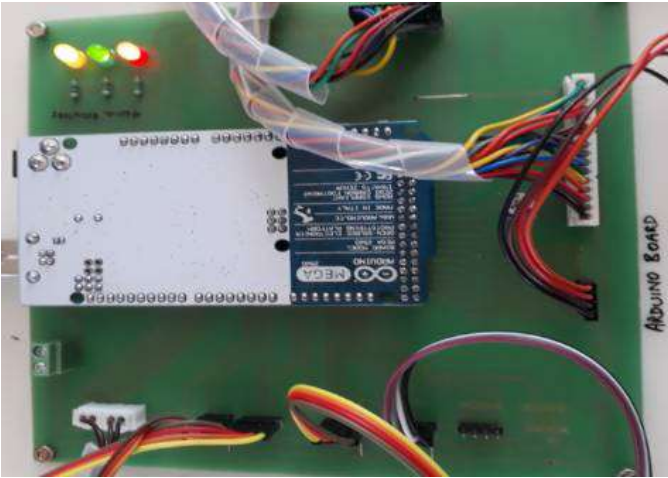**Fig-4: GSM initialization**

GSM modules must be initialized with a valid SIM card inserted into it to get a secure communication about the student's in or out from the bus to the parent. Fig.4 shows the yellow led light glowing which indicates GSM module has been initialized properly.
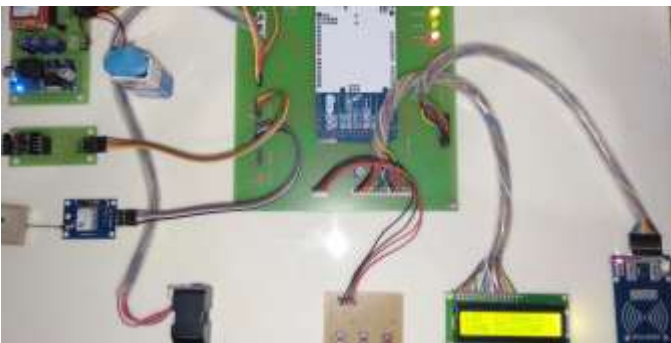

Fig-5: IoT initialization

IOT module should be initialized to ensure a secure environment for communication between devices. It connects to the mobile hotspot and provides data communication from hardware to the mobile device as well as among the devices. Fig 5 shows the green light glowing along with yellow light ON which indicates proper IOT initialization.

Fig-6:GPS initialization

To obtain the exact latitude and longitude values of the current location to be displayed on the LCD display, the GPS module should be initialized. Fig,6 shows the glowing red light along with yellow light and green light ON which indicates the successful initialization of the GSM module.

Fig-7: Latitude and longitude display on LCD

After complete initialization of all the systems, the GPS module supplies the latitude and longitude of the system's current location at rest. Fig.7 displays the text that is the latitude and longitude of the position on the LCD display.

Fig-8: Student registration

The RFID reader which scans the RFID card when the student enters the bus must authenticate each pupil. Fig.8 displays the text that appears on the LCD panel after RFID reader authentication of the user.

Fig-9: Student not authenticated

If the student is not legitimate or he / she uses an incorrect fingerprint for authentication, the LCD monitor will show a note. For students not authenticated, Fig.9 displays the related text on the LCD panel.


Fig-10: Put finger on LCD

If the student is identified from the validation of the RFID passport, the fingerprint sensor is able to take the correct finger print for more user authentication. The text "place finger" on the LCD is seen in Fig.10 which means that the student wants to put his correct fingerprint for further authentication.

Fig-11: Student authentication

When the student is identified to be authenticated with the correct RFID card and the correct fingerprint, the LCD monitor shows an authorization message along with the

student's name. Fig.11 indicates the student is authenticated and allowed to join the bus.
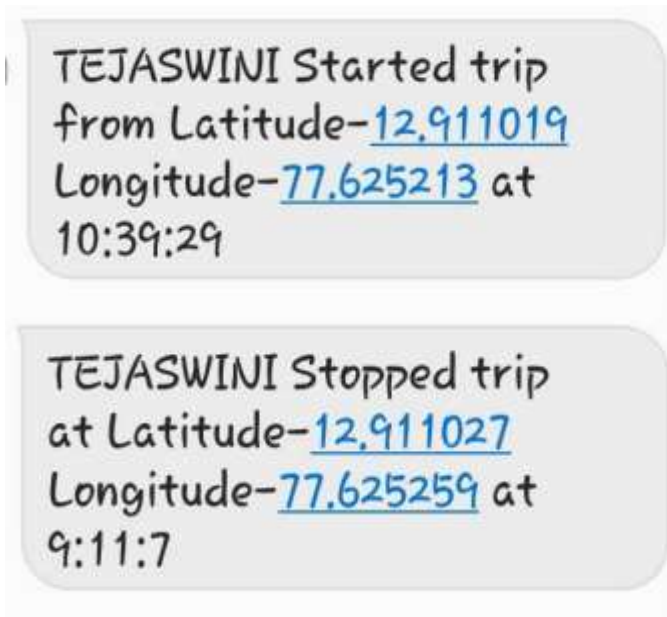
Fig-12: SMS to the parent

As soon as the student reaches the bus, an SMS will be sent to the student's parent using the student's mobile number previously received. The SMS consists of the name of the student, the start / stop journey, the latitude and the longitude of the bus venue, as well as the timings when the student is in the bus.Fig.12 shows the text message about the entrance and exit of the student to and from the bus which is sent to the valid mobile number of the parent.

6. CONCLUSION AND FUTURE ENHANCEMENT

The paper reveals the college bus's real-time monitoring, it sends SMS regarding their ward entry and departure from the bus to parents. The device manages to track the bus position during the journey which helps in continuous tracking of the location of their room. The report will concentrate on applying the iris detection to prevent fingerprint forgery in the future. Face recognition can be achieved using an automated camera, and the image processing can be used to suit the picture from the database. For the administration as well as for the individual users for authentication a separate login page can be implemented in the android application.

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