

## SMART SCHOOL BUS TRACKING SYSTEM USING GPS, GSM MODEM & RFID READER

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### Abstract:

*This paper carries out studies on bringing further improvements in school transportation system and reducing the number of deaths of children caused due to bus accidents or due to being left unattended in school bus. We have come up with a solution by designing Smart School Bus Tracking System installing devices like GPS which will send location updates to parents & school authorities by sending SMS using GSM MODULE. And to make it further advanced, RFID tag reader will be installed at entrances of school bus door, which will mark their attendance when they'll scan their ID cards against RFID reader installed at entrance of bus doors. All these devices (GPS, GSM MODULE & RFID reader) will be programmed using Arduino*

**Keywords:** Arduino UNO, Arduino IDE, GPS Modem , GSM modem , RFID Tag

### INTRODUCTION

Our research paper revolves with the ideology of installation of SMART or IOT devices in school buses which will make them more secure, efficient in operation. These days many Students travel to school by School Buses & Parents are concerned about their safety. There are many incidents taking place such as bus getting delayed in traffic, child being left unattended in bus if accidentally slept or not being able to tell exact location of home if child is from kindergarten.

The emergence of IoT (Internet of Things) technology has played crucial role in our lives. Students spend enormous amount of time travelling by school buses and there must be something to keep track of activities happening inside school bus.

This project is designed based on existing technology & further enhancement is made to overcome these problems.

GPS, GSM, RFID technologies are used to track students' attendance on the bus, drop and pick up times and locations, to alert concerned parents as well

as school at certain occasions. All the instruments like GPS, GSM modem & RFID tag reader will be programmed using Arduino. Here GPS modem, GSM Module & RFID reader will collect information like location coordinates, students attendance & send to web server using Telecom infrastructure or GPRS .Then the Web Server plots the location in Map & then sends the parents and school arrival and location stop of School bus via SMS using GSM module. Hence with this the safety of child in school buses increase a lot. With the help of RFID reader student's attendance can be marked and sent to school database as well, reducing the possibility of child being left unattended in school bus. The paper further incorporates the development and implementation of this project where the future scope is also recognized.

### LITERATURE REVIEW

Akshatha S.A[1] portrayed execution of GPS based vehicle tracking system using GPS and Raspberry Pi, with this GPS will be programmed using Raspberry Pi and location of vehicle can be traced.

Hazza Alshamisi [2] portrayed in his work fully web-based GPS tracking system of vehicles using GSM & Web technology where location of vehicle can be traced online using Google Map.

Prashant Kokane [3] designed Accident alert system using GPS, GSM technology and Vibration Sensor which will help in detecting vehicles passing nearby and will help to reduce/avoid accident.

Reference [4], highlights the use of cloud computing and the risk factors it can face. Also, the future ,challenges and benefits are also included. Kim depicted that there are many benefits of using present cloud models & how threats can be detected using current architecture.

### METHODOLOGY:

The following gives the description of how data is being transmitted followed by Software & Hardware Components used.

**System Architecture:**

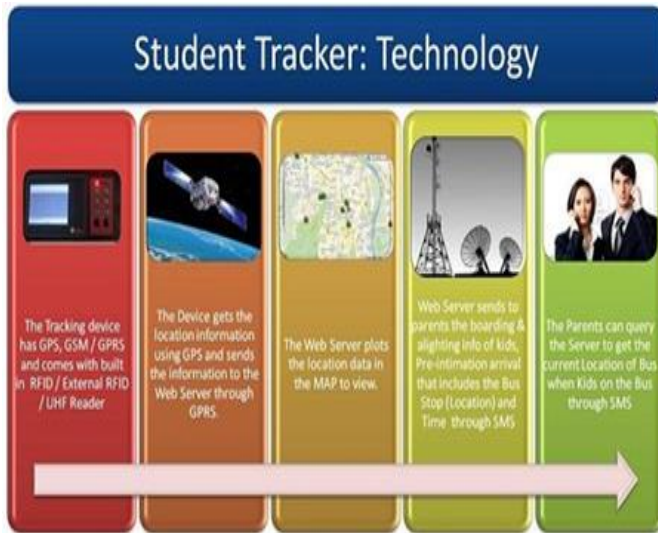


Figure 1 : System Architecture

**Software Requirement:**

**(A) ARDUINO IDE**

ARDUINO IDE software is being used in the programming and executing the identification in terms of biometric license identification. Prototyping can be done easily and rapidly with the help of ARDUINO platform and can be performed by running on "Linux, Windows, Mac OS X". Arduino will be programmed to send SMS from GSM module to recipient mobile phone by receiving the GPS data from GPS module, then it will decode GPS data into 'latitude' and 'longitude' values and send to GSM module which will deliver those values as message on recipient mobile phone. It will also help to identify different students entering in bus when programmed to RFID reader.

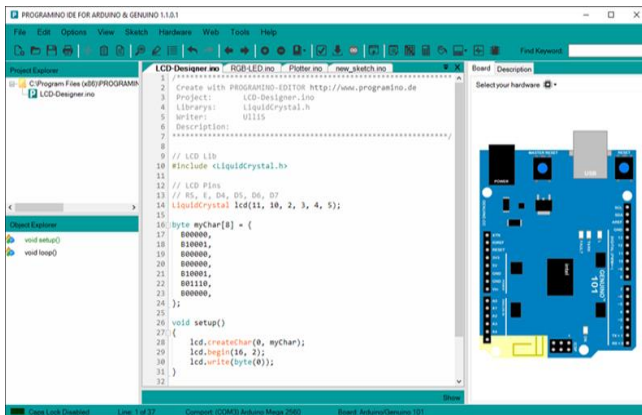


Figure 2. Glimpse of Arduino Software

**Hardware Requirements:**

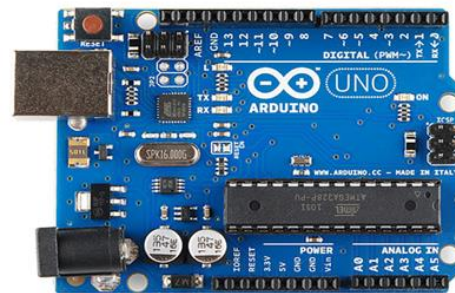
**1.GPS Modem:**



Figure 3: GPS Modem

GPS modem gets connected with the satellites required. It calculates the co-ordinates of location of the vehicle and Arduino receives data from GPS modem. It can trace the location of vehicle or person anywhere. There are about 24 to 32 satellites which facilitates the efficient working of GPS. The GPS Modem will help to determine location of vehicle and send the raw data to Arduino which will help to convert it to 'latitude' and 'longitude' values, and forward the data to GSM module. The main utilization for the GPS involves mapping, tracking and surveillance.

**2. ARDUINO**



UNO:

Figure 4: Arduino UNO

"Arduino UNO is a microcontroller board based on the ATmega328", it has 14 digital(I/O), six of them can be used as PWM outputs. It can be programmed by using Arduino programming language (based on wiring), and the Arduino software (IDE) based on processing. There will be 2 Arduinos used in project: one for RFID tagging and one for GPS tracking. One Arduino for RFID will be programmed for RFID tag identification where student's id card will have

RFID chip which scanned with RFID programmed with Arduino to mark their attendance. And Second Arduino will be programmed to send GPS location to recipient mobile phones using GPS & GSM modem.

**3. GSM Modem:**



FIGURE 5: GSM Modem

GSM (Global System for Mobile Communications) is a standard developed device to describe different arrangements for 2<sup>nd</sup> generation digital cellular networks used by mobile phones. SIM-800 A GSM module has been used for this project. “It is a type of modem that accepts a SIM card and functions over a subscription to a network provider, just like a mobile phone”. It will be capable of sending and receiving SMS & MMS messages. Hence this modem when programmed with Arduino will send SMS with GPS location to both parent and school authorities.

**4. RFID TAGGING:**

RFID tagging is an ID tracking system that uses chip & small antenna for identification and tracking purposes. A RFID tag can usually store 1KB of data which is sufficient for storing the details of student like name, roll number, unique identification number, birth date and some more information. An RFID tag reader system includes the tag itself, a read/write device (RFID READER), and a host system application for data collection, processing, and transmission.

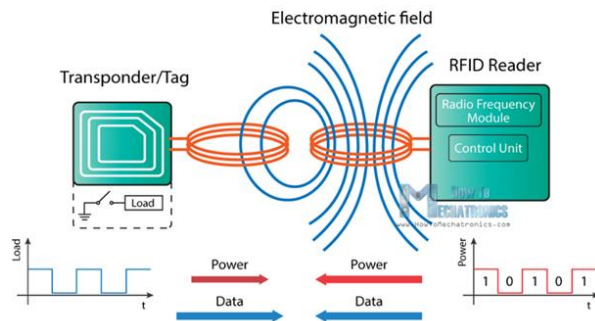


FIGURE 6: Working of RFID Technology

**DEVELOPMENT AND IMPLEMENTATION:**

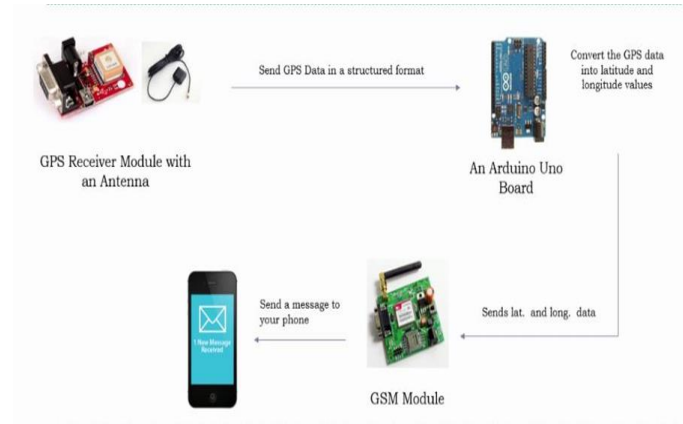


Figure 7: Flowchart showing how the data will be transmitted from GPS to Mobile phone

This is diagrammatic representation of how GPS Module will receive location data of vehicle, will send the data to Arduino which will convert the GPS data into latitude and longitude values and send the data to GSM module which act like mobile phone and send Location via SMS to recipient Mobile phone.

**RESULTS AND DISCUSSION:**

The components used in this project are cost effective and all schools will be ready to implement this in their school transportation system. Survey was taken from few schools in Oman regarding Installation of GPS, GSM Modem & RFID tag readers in their school buses & many of them agreed to implement this in their school buses, here are the names of following schools:

**Table 1: Surveys taken from various schools regarding implementation**

Serial no.	School name	Ready to implement
1.)	Tabaraq Private School	Yes
2.)	Al Ruwad International school	Yes
3.)	Al Mawaleh Private School	Yes
4.)	Aisha Rasbiya elementary school	Yes
5.)	Roudhat Al fikr Elementary school	Yes
6.)	Indian School Al Wadi Al Kabir	Yes

## CONCLUSION:

This paper has highlighted the need to implement this in school buses. It has also described the details about all devices used in project and its cost effectiveness, which will make all schools in Oman ready to implement this. Our system is designed with the following requirements which are engineered:

- The system will recognize presence of each student and detect when every student boards or leaves the bus.
- The system will have a database to store student's information.
- The system will be easy to re-configure.
- The communication will be authentic.

Hence this system will reduce number of accidents taking place, leading to reduction in number of death of students taking place due to road accidents, which will help parents to trust on school authorities easily and the pressure on school authorities will decrease.

## FUTURE SCOPE OF WORK:

The proposed work is successfully tested and implemented. Use of this technology can also be implemented in Public Bus Transport services.

This will reduce the waiting time for the users. Users can track the location of vehicle & if Vehicle causes any delay, can inquire the transport Services about it. With the help of RFID tags E-ticketing system can be implemented in buses in future. Also, the security of Public transport system will increase further and transport authorities can keep track of activities inside bus, leading to reduce in number of late-night crimes and increase in security. Hence with this greater number of People will prefer travelling by Public Transport if there will be increased security in buses.

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