

# Android Application for School Bus Tracking and Time Prediction System

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**Abstract-** Safety of children is the most important to their parents. In present time due to increase in number of kidnapping and road accident cases, parents always worry about their children. It is important for the parents to know about where their children are exactly. And also, the bus arrival time is merely essential for all parents as the technology gets growing. In recent days, it was identified that long waiting time for bus stop often discourages the parents. The primary issue in the existing system is parents have to predict the arrival time of the bus due to lack of technology usage. When the bus is breakdown, the school admin should need to inform the message to all parents manually. To aid in the removal of these constraints, this paper presents GPS bus tracker, a personal location tracker application for android users. Whenever the parents want to know the location of their children, they can directly communicate with the GPS module that is located inside the bus. All the student, driver and bus route details are stored in sql database.

**Index Terms-** Bus Tracking, Google Maps, Android, Global Positioning System (GPS), Location Based Services, Short Message Service (SMS) based alert.

## I. INTRODUCTION

School bus plays an important role in carrying most of the children every day. While there are certain conflicts need to be answered from the school side, stating from the time of arrival and exact location of their children to be informed to their parents. This paper aspires to look into initiating the safety with respect of school buses by using bus tracking that will help the parents to pick up their kids in more easy and secure way.

Now a days due to increase in number of Vehicles, the road traffic is also a pitfall to the Parents since it increases the arrival time of the school bus. A recent review says that late arrival time often makes a bad opinion about school management. To remove this

pitfall, in this project, we present a bus arrival time prediction system based on school bus participatory sensing. To track the location of the student, and view the route path, Google map API is integrated with Bustracking application. And also, Short Message alerts will be sent to the parents if the regular route is changed.

This paper arranged as follows. Section II describes the related work to the topic of this paper. In section III, proposed system is explained. Section IV explains detailed description of system along with system diagram. Eventually, section V concludes the paper.

## II. RELATED WORK:

The most related work to this issue is stated by this project is presented in this segment. In [6], the author Jisha R.C introduces a framework that traces location of school bus using IOT and GPS that feeds the location of school bus to a database and cellphone of students. The drawback of this framework is that wide scale deployment is costly since it makes use of IOT and RFID mostly.

Zambada, et al [2], propose a school bus monitoring system with the use of localization and speed sensors. This will allow parents and school authority to keep real-time track of the school bus behavior. A publish and subscribe architecture [4] is used; a parent or any stakeholder, who needs data is called subscriber. S. Lee, G. Tewolde and J. Kwon developed and tested a vehicle tracking system, in this paper an in-vehicle device comprised of GPS, GSM and General Packet Radio service (GPRS) modules, and it is embedded inside the vehicle, whose position is to be tracked in real time using a Smartphone application.

In [4], the author Saranya introduces an application framework that traces location of youngsters using a child module that transmits the following data to a

database and a cell phone. The drawback of this framework is that the module may not be suitable for children and it would cost more for implementation.

A paper [7] titled "SMS Based Kids Tracking and Safety System by Using RFID and GSM" by Nitin Shyam proposes using two different modules for tracking the child with the help of RFID, GSM and GPS. One module is to be carried by the child and the other module is fitted in the bus. The problem with this system is it uses two different modules to keep track of the child. It increases the operational cost of the overall system and also it is not feasible for the child to carry an extra kit every time he goes to the school.

Singla in [8] proposed a GPS-based Bus Tracking System. It is an application that has its client side on the Android platform and the main objective of this paper is to acquire real-time location of the bus and the updated transit schedule of the bus-route, it is comprised of two main modules; a GPS-based sub-system, which tracks the current location; the other modules predicted the average velocity of the bus using clustering and back propagation method.

To make efficient tracking system some papers have introduced features like bus arrival time calculation. Liu, et al in [9] integrated the k- nearest neighbor (k-NN) algorithm with cluster analysis and applied principal component analysis (PCA) for computations of bus arrival times. Road traffic is the key factor that effects arrival time calculations.

### III. PROPOSED SYSTEM

The proposed system consists of both hardware and software module. The hardware layer is made of tracking module. The core part of the tracking module is GPS Module which is used to track the location of the bus. On receipt the data is stored in the server for future use. The software module is comprised of a arrival time prediction and a client side application. Client-side application allows the user to view the dynamic movement of the vehicle with predicted arrival times. Client-side application was developed on an Android platform. Fig.1 shows the three-layered architecture diagram of the system. A RFID tag with a unique id is connected to microcontroller for further processing. The tracking device is placed near the door of school bus so that an alert message will be sent to parents whenever a

student gets into the bus or leaves the bus. GPS is used for tracking process. To estimate the accurate arrival time of the bus, a Kalman filtering dynamic algorithm is used.

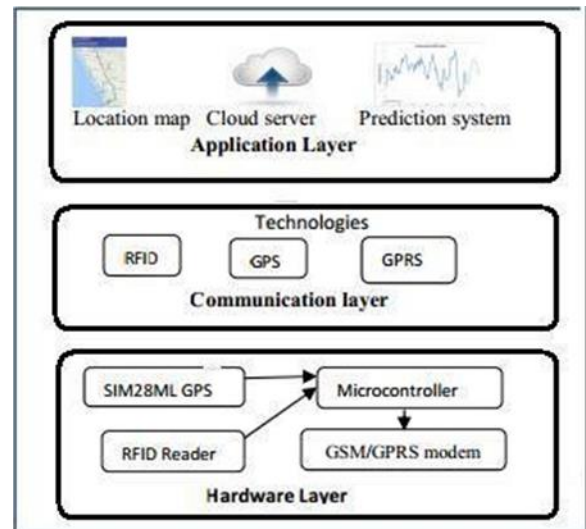


Fig.1: Architecture diagram

#### A. Hardware Layer

The hardware layer consists of an Arduino Mega microcontroller (MCU), GPS receiver, RFID reader module. The RFID reader module is used to read the RFID tag data. Here we use a passive reader. Once the data is received by the reader via the serial port of Arduino, GPS receiver will retrieve the its Geolocation. After processing the data from GPS and RFID reader, microcontroller will transmit the data to cloud storage through GPRS modem. The various hardware components of the device are explained below

1). Microcontroller: The Arduino mega microcontroller serves as the core part of the tracking module to control the school bus tracking system. A C language program, saved in the microcontroller's memory, controls the modules, The Arduino Mega 2560 has 54 digital input/output pins, 16 analog inputs, 4 UARTs. The proposed system uses 3 UARTs-one for RFID, and one for GPS Receiver.

2). RFID Reader: One of the key hardware components in the system is EM 18 RFID Reader. This is the most commonly used RFID reader to read 125 KHz tag. It contains an antenna that can be powered by 5V power supply. RFID is an automatic identification technology where digital data is encoded in an RFID tag. The reader is a radio

frequency (RF) transmitter and receiver, controlled by a microprocessor/MCU. The antenna attached inside the reader captures data from tags, then passes the data for processing. Tags are issued to each student, together with their roll numbers. When the tag is placed near the reader, it will get energized and data is transferred to reader, using radio waves.

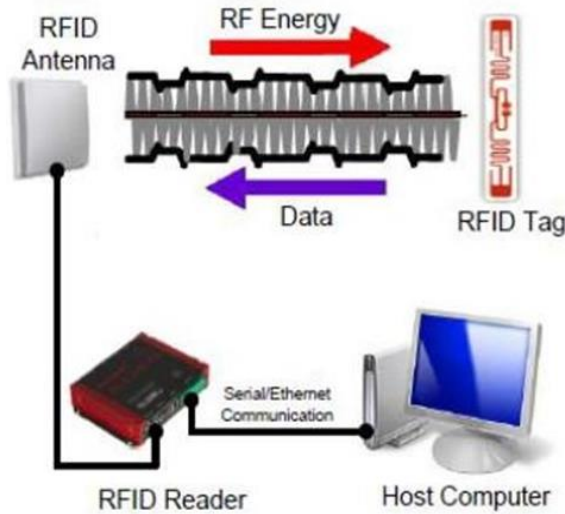


Fig.2: Working of RFID Technology

3). GPS: The United States' Department of Defense developed GPS system. It uses somewhere around 32 and 24 Medium Earth Orbit satellites that transmit accurate microwave signals. GPS works 24 hours a day in any climatic condition. For GPS usage no membership or any set up charges are required. Each GPS satellite sends signal to GPS receiver. Precise time signals are transmitted from satellite. To distinguish the distance from each satellite the GPS calculates by subtracting the time at which signal was transmitted from the time at which signal was received. While sending signals GPS also knows specific position of satellites in the sky. So, from the given travel time of GPS signals satellite's exact position in the sky, from the 3 satellites, the GPS receiver can determine position in three dimensions - east, north and altitude.

The proposed system uses SIM 28 ML GPS receiver which has excellent low power consumption characteristics. The module has complete signal processing from antenna in NMEA messages. This module requires 12V power supply. The host port is configurable to UART. Transmitter pin of modem is connected to receiver pin of Microcontroller. The

Global Positioning System (GPS) helps to provide geographic coordinates of object anywhere on Earth with exact Universal Time Coordinated time (UTC). GPS offers great accuracy and generate real-time tracking location data. GPS satellite transmits the location data. GPS receiver receives the signals in NMEA format. There are different NMEA signals. We are focused on GPRMC signal, since it contains location information along with the speed

B.Communication Layer

Communication layer is used to establish a connection with underlying hardware, the MCU and the upper layer applications. Various underlying technologies used to develop the application are RFID, GPS and GPRS. Various technologies used for the communication are explained below.

C.Application Layer

1)Mobile Application: The latitude and Longitude coordinates are sent to the server. A mobile application has been developed to access location data and display the vehicles movement in Google map, using Google map API. Parents can retrieve information, where users select the bus route number and date, and receive the transit time schedule.

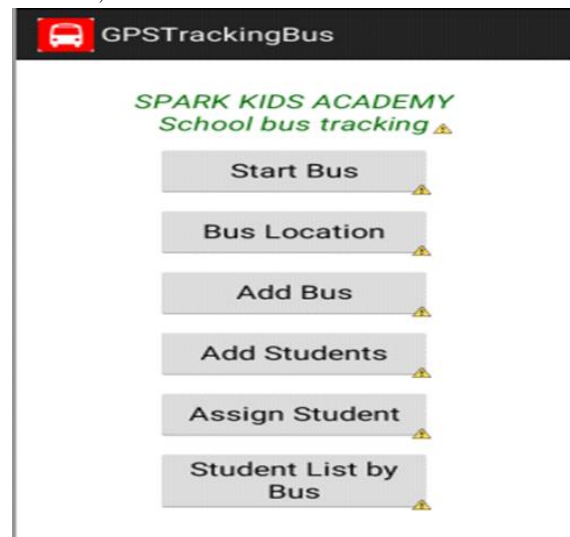


Fig .3: Admin Form

2) Server: The server is to store details of driver and students and the route information and also used to store and analyses information sent from sensors. [figure 3] While sending data to server, it can easily create SMS notification [Figure 4].

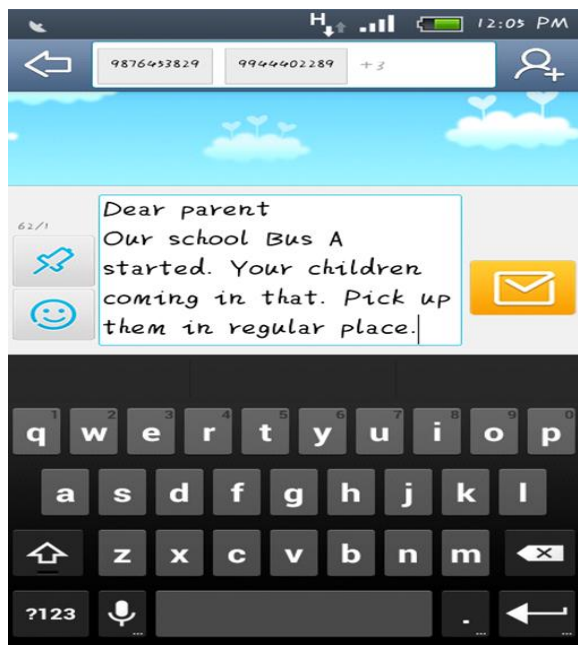


Fig.4: Sending SMS Notification

#### REQUIREMENTS FOR THE APPLICATION OF FUNCTION OPTIMALLY

Optimum Conditions required in the phone at the time of using the app:

- Sufficient Battery life –most phones released with good battery life in the recent times.
- Fast Internet speed with good signal strength 3g/4g internet speeds are preferred whereas 2g speeds would be a little slow to update the location data.
- GPS must be enabled- every smartphone comes with GPS chip enabled in them but the higher the Accuracy the better the performance.
- Less Background applications-many background applications consumes RAM memory making the OS to force the application to be close.

#### IV.CONCLUSION

The purpose of this paper is to provide an application to help the parents to track the location of their children. This ensures their children safety. This kind of app is needed for our society where the missing children number is increasing day by day. The app can help in a way that parents feel safe about their children because the location of the children and their arrival time can be tracked. Thus, this app can help in a big way to the parents for their children safety.

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