

MRTTM: Mobile based Real Time Tracking and Monitoring of Vehicles

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Abstract- Vehicle Tracking and Monitoring System (VTMS) is a technology which helps to monitor and track the vehicle using various technologies. An advanced vehicle monitoring and tracking system, notifying the vehicle's owner by sending an alert message with the help of Arduino atmega, Sensors and a Mobile application in real time. The GPS, GSM and GPRS play a major role in the proposed mobile communication based application. GPS service is used to track the current location of a vehicle. GSM is utilized for sending an alert message to vehicle's owner mobile. GPRS sends the tracking information to the server periodically. The Arduino fetches the data from the server and matches the data with the predefined route/path. In case of rerouting/wrong routing, an immediate notification message is sent to the users through mobile application. If the vehicle's speed and vibration goes beyond the specified values, then a warning message will be sent from system to the vehicle owner's mobile. The same VTMS system is also used for the purpose of intimating/informing the bus timings in the various/nearer bus stops to the mobile application users.

Keywords- Arduino, sensors, mobile application.

I. INTRODUCTION

Vehicle Tracking System (VTS) is the technology used to determine the location of a vehicle using different methods like the GPS. By triangulation or trilateration methods the tracking system enables to calculate easy and accurate location of the vehicle. Vehicle information like location details, speed, distance travelled etc. Can be viewed on a digital mapping with the help of a software via Internet. Even data can be stored and downloaded to a computer from the GPS unit at a base station and that can later be used for analysis. This system is a theft prevention and retrieval device. The system consists of modern hardware and software components enabling one to track their vehicle in online or in offline. The essential components are elaborated below:

i. Vehicle Unit:

It is the hardware component attached to the vehicle having either a GPS/GSM modem. The unit is configured

around a primary modem that functions with the tracking software by receiving signals from GPS satellites or radio station points with the help of antenna. The controller modem converts the data and sends the vehicle location data to the server.

ii. Fixed Base Station:

Consists of a wireless network to receive and forward the data to the data center. Maps of every city and landmarks are available in the base station that has an in-built Web Server.

iii. Database and Software:

The position information or the coordinates of each visiting points are stored in a database, which later can be viewed in a display screen using digital maps. However, the users have to connect themselves to the web server with the respective vehicle ID stored in the database and only then she/he can view the location of vehicle travelled.

To know about the vibration status of the vehicle and the speed levels, vibration and speed sensors are used. If accident occurs unexpectedly, the vibration sensors which are placed inside the vehicle sends a message to the owner along with the latitude and longitude though the vehicle is crashed. It makes the owner to take immediate actions.

To intimate the owner if any of the levels exceed the specified limits, or accident occurs unexpectedly, the sensors which are placed inside the vehicle sends a message to the owner in along with the latitude and longitude though the vehicle is crashed. So, this makes the owner to take immediate actions.

II. LITERATURE SURVEY

Kumar et al[1] proposed a vehicle tracking system in which data is required and collected with various dimensions from the end point view. The original form of data extracted from GPS device received for the account ,a user who is interested in tracking using LBS based Vehicle Tracking

System is used. The processing of that kind of data cannot be done for providing information to the user of Vehicle Tracking System. This data converted into workable format (like .xml) for getting meaningful information. This paper talks about providing better security.

Lee et al[2] proposed an automated vehicle tracking system for real time use. They proposed a vehicle tracking system using GPS/GPRS/GSM technology and a Smartphone application to provide better service and cost - effective solution for users. They described the design and implementation of the vehicle tracking system. An in-vehicle device, a server and a Smart phone application are used for the vehicle tracking system. In this work the, the vehicle device is composed of a microcontroller and GPS/GSM/GPRS module to acquire the vehicle's location information and transmit it to a server through GSM/GPRS network. On the other end, the web interface written in the php is implemented to directly connect to a database. A vehicle's geographic coordinates and a vehicle's unique ID obtained from a vehicle device are recorded in a database table and a smart phone application on Google maps.

Santhiyal et al. [3] proposed a mobile application in which they focused on women tracking system for all working women. There is no powerful existing system to prevent the crime rates against women. This system gives information about a woman or a victim who has low assurance about their safety to their respective family and the place where they work, which have to be more concerned about their women workers. This system includes the victim module and two receiver modules for getting information about the missed women. This arrangement includes Microcontroller, Global Positioning System (GPS), and Global Arrangement for Mobile communication (GSM), and the receiver module that includes an Android mobile mechanism of the victim's relations and a monitoring database in the manipulation room of the corresponding Association or workplace. With the constant progress of intelligent mobile phone hardware and multimedia Technologies, it becomes more and extra facility for mobile phones and supplementary mobile terminals accessing to the web and becoming information.

The existing system provides a fully automated tracking and monitoring of the vehicle which helpful for school bus, their owners, children's safety and also it provides the accurate arrival time of the vehicle at particular location or stop. And hence using accuracy in time, children can spend more time in studying, sleeping or relaxing rather than wait for a delayed bus. Spending less time waiting for a bus improves comfortable and effective time management of the student as well. In order to reduce man power and saving of money, here

the system provides easy tracking solution using Embedded Linux Board. In the database base monitoring and updating mechanism, the GSM/GPRS module is used which transmit the updated vehicle database to the server and user access the database using web page in Smartphone Thus, users will be able to continuously monitor a moving vehicle on demand using the Smartphone and determine the estimated distance and time for the vehicle to arrive at a given destination. Temperature and gas sensors were used to detect any leakage of the vehicle and an immediate alert message is sent to owner in case of emergency.

In the existing system, the owner can only get a notification message mentioning that the vehicle has taken a wrong path and it does not provide much safety and security for the people.

In the next section, the hardware components utilized in the proposed system are elaborated with the diagram. Detailed explanation of the proposed system is presented in section IV.

III. PROPOSED SYSTEM

Continuously monitoring and tracking the vehicle at real time environment using smartphone and if the vehicle choose wrong path then system give the alert to the owner's Smartphone as well as on raspberry pi's audio system.

- The provision of more safety and secure travelling using travelling path selection facility based on android application of Smartphone.
- Storing and updating the real time database of the vehicle like its Speed, Time, Location, and Date which is useful in case of vehicle theft detection.

The proposed system would get controlled with the help of Arduino which placed inside the vehicle. The GPS/GPRS/GSM SIM808A module get communicate with Arduino using USB interface. The longitudes and latitudes of the current path received from GPS get compared with the stored longitudes and latitudes in the particular file format inside the database of arduino. If that longitudes and latitudes not match with the stored one then wrong path detection alert message will get sent to vehicle's owner mobile. Also the longitudes and latitudes of the current path received from GPS will get sent to the server with the help of GPRS which helps to track the vehicle's current location on the web page using Smartphone. The proposed system provide safety with the help of vibration sensor and speed sensor. These sensors get interface with arduino. If the vibration inside the vehicle crosses the specific value or speed level increases then the

alert message will sent to the vehicle’s owner. Likewise safety mechanism provided by system. If the vehicle for instance., the bus is going to reach the mentioned stop , then a message will be sent to the user in prior along with the time taken for arrival.

Fig 1-6 shows the flow diagram and the components used

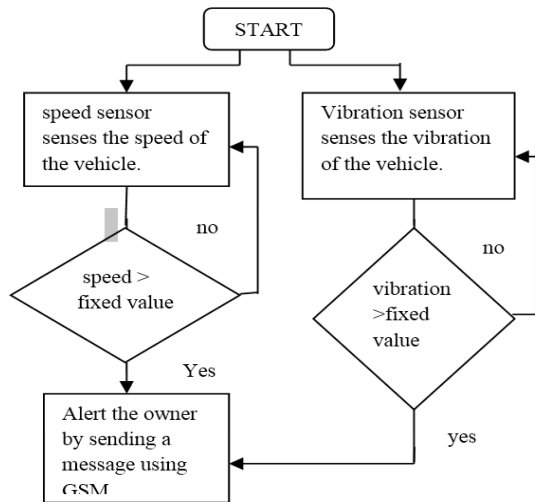


Figure 1. Flow diagram of the Proposed System

1. Arduino ATmega328P

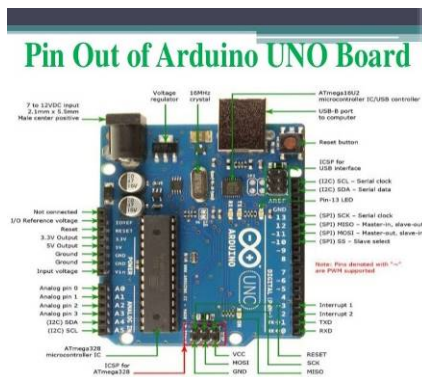


Figure 2. Pin Diagram of Arduino

Features of Arduino uno board:

- Microcontroller: ATmega328P
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA

2. Vibration sensor (piezo electric plate)

This basic piezo sensor from Measurement Specialties is often used for flex, touch, vibration and shock measurements. A small AC and large voltage (up to +/-90V) is created when the film moves back and forth. A simple resistor should get the voltage down to ADC levels. It can also be used for impact sensing or a flexible switch.

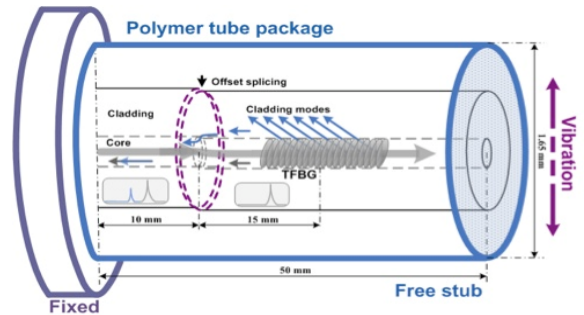


Figure 3 A typical raw vibration sensor. This device would include a connector to allow transmission of an output signal.

3. Speed sensor (LM393)

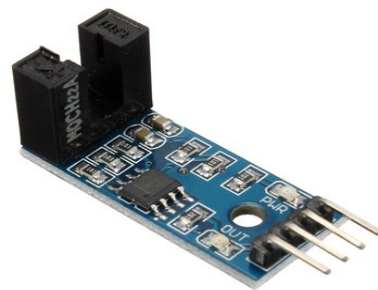


Figure 4. Speed Sensor

Features of LM393P speed sensor:

- Working voltage: 3.3V~5V
- Weight: 8g
- Dimensions: Approx.3.2 x 1.4 x 0.7cm 5mm
- Groove width Using wide voltage LM393 comparator.
- Application: Widely used in dynamo speed detecting, pulse counting, etc.,

4. GPS/GSM/GPRS (SIM808)

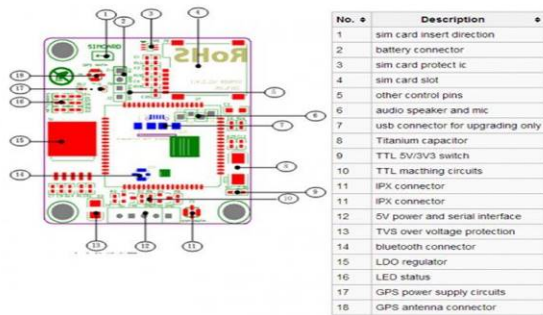


Figure 5. Layout for SIM808

ARCHITECTURE:

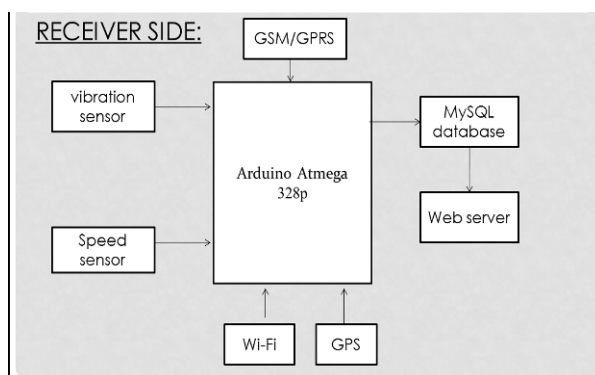


Figure 6. Architecture of Receiver Side

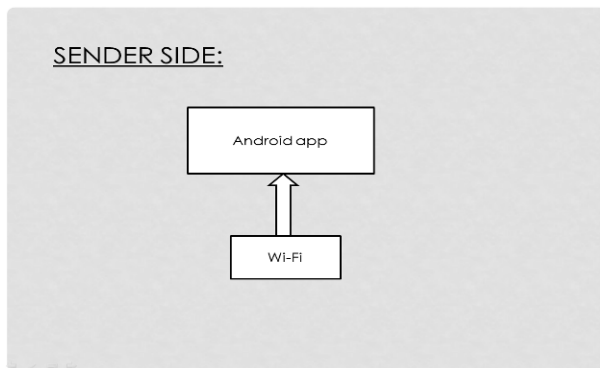


Figure 7. Architecture of Sender Side

RECEIVER SIDE:

a) Arduino ATmega328p:

It acts as a database which contains all the information of the vehicle. It works as an interface between the vehicle and the owner by comparing the specified and the current limits of speed and vibration levels.

b) GSM/GPRS:

GSM and GPRS act as modules which plays a major role in mobile communication technologies. GSM is used to send message to the smart phone and GPRS, an extension of GSM is used to do the same but in the presence of network connectivity. A SIM808 module is used which is used to send a notification message to the owner, people and others if necessary after fetching the data from the Arduino in case of emergency.

c) GPS:

GPS is used to monitor and track the vehicle's location, keep notifying the vehicle's driving mode. The paths will be already specified in the Arduino. GPS and Arduino keep monitoring the vehicle and if it goes in a wrong route, it notifies the path immediately and send a message to the owner with the help of GSM/GPRS along with the latitude, longitude, time and date. Apart from these, it is also used to get the intermediate paths between the source and the destination locations. Using a mobile application, the user can get information about the vehicle for instance, bus is going to reach the mentioned stop, then a message will be sent prior to the user along with the time taken for arrival.

d) WIFI:

It acts as a support for network connectivity. Other than GPRS, the working process can take place even in the presence of WIFI connectivity.

e) Speed sensor:

Speed sensor LM393 is one of the major modules used to monitor the vehicle's speed. In this sensor, rpm is calculated and minimum, normal and the maximum limits are set in the vehicle and these information are contained in the Arduino. The sensor matches the vehicle's current speed with the specified limit. If it crosses the limit, it detects and automatically send a message to the owner, people and the others if necessary that the vehicle has crossed the speed limit. This makes everyone to be awake all the time.

f) Vibration sensor:

Vibration sensor (piezo electric plate) is used here. This basic piezo sensor from Measurement Specialties is often used for flex, touch, vibration and shock measurements. A small AC and large voltage (up to +/-90V) is created when the film moves back and forth. A simple resistor should get the voltage down to ADC levels. It can also be used for impact sensing or a flexible switch. The minimum, normal and the maximum sensitivity levels are set in the vehicles as fixed

limits. The sensor keep monitoring the vehicle’s vibration level and if it exceeds the limit, it sends a message to the owner, people and the others in fraction of milliseconds. If any accident occurs unexpectedly, it will be immediately known by the owner and useful to take immediate actions.

g) Mysql database:

All types of information of the vehicle will be stored in Mysql database. This database is used by the Arduino to fetch the data and send the relevant information to the others modules used.

h) Web server:

It plays a major role containing all sorts of information about the vehicle, vehicle’s owner and the others. Separate logins are created for owner and the others for viewing the information by registering on the webpages. After successful login, the user can fetch the information about the vehicle.

SENDER SIDE:

a) Android application:

The mobile application is developed to execute all the features containing GPS, GSM and GPRS. The GPS is integrated with the google map and generate a key to know the intermediate places and also send the information prior to the users who are all using the application. For instance, if the bus is going to reach the mentioned stop ,then a message will be sent prior to the user along with the time taken for arrival.

b) WIFI:

It acts as a support for network connectivity. Other than GPRS, the working process can take place even in the presence of WIFI connectivity.

Fig7-9 represents the screenshots of the application :

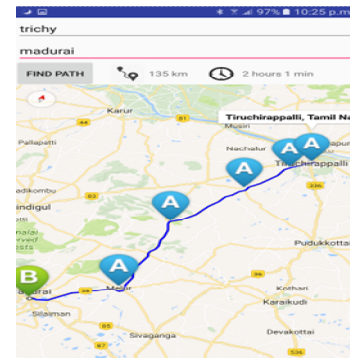


Figure 8. Screenshot of the map.

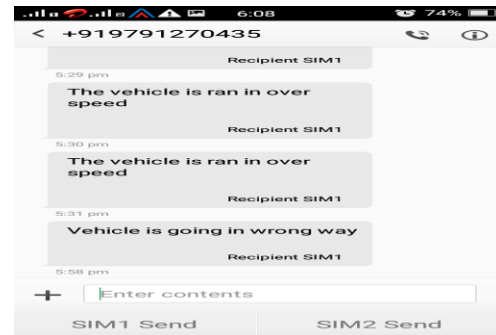


Figure 9. Screenshot of the message using Arduino

SNo	Speed	Vibration	Latitude	Longitude	Entry Time
55	NormalSpeed	AccidentStop	10.8109802	78.14933580000004	2017-03-12 12:28:39 pm
52	NormalSpeed	AccidentStop	10.8109802	78.14933580000004	2017-03-12 12:28:39 pm
51	NormalSpeed	AccidentStop	10.8109802	78.14933580000004	2017-03-12 12:28:39 pm
50	OverSpeed	AccidentStop	10.3790212	78.38933580000004	2017-03-12 12:28:39 pm
49	OverSpeed	AccidentStop	10.3790212	78.38933580000004	2017-03-12 12:28:39 pm
48	OverSpeed	AccidentStop	10.3790212	78.38933580000004	2017-03-12 12:28:39 pm
47	NormalSpeed	AccidentStop	10.3790212	78.38933580000004	2017-03-12 12:28:39 pm
46	NormalSpeed	AccidentStop	10.3790212	78.38933580000004	2017-03-12 12:28:39 pm
45	OverSpeed	AccidentStop	10.3790212	78.38933580000004	2017-03-12 12:28:39 pm
44	OverSpeed	AccidentStop	10.3790212	78.38933580000004	2017-03-12 12:28:39 pm

Figure 10. Screenshot of the monitoring screen

IV. CONCLUSION

This system made a good use of smartphone technology by providing safety and secures travelling using wrong path alert mechanism. It plays a major role in real time tracking and monitoring of vehicle by updating vehicle real time information on the server side after certain interval of time in order to monitor vehicle continuously. Whenever

driver drives vehicle on the wrong path or in case of vehicle's accident situation occurs, it provides the vehicle's current location, speed to the owner's mobile. People's safety mechanism also gets provided using speed and vibration sensors. In this situation, the proposed system also gives alert message on emergency number so that they also know about their safety.

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