

Design and Development of Vehicle Tracking and Monitoring System

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Abstract

As being the fast growing economy India is one of the most populous countries in the world. We are facing terrible road congestion problems nowadays. Due to space and cost, infrastructure growth normally slows down and numbers of vehicles are increasing day by day. The vehicle tracking and monitoring system is used for monitoring a vehicle from any location to any other location at real time. It provides safe environment to all who travels. It would make use of growing technology that based on Embedded Linux board namely Raspberry Pi and stores database at real time. The proposed system works on Global Positioning System (GPS) and Global System for Mobile Communication (GSM) and it is used for vehicle tracking and monitoring mechanism. The GPS gives current location of the vehicle and the GSM is used for communicating with owner by sending an alert message to his or her mobile. The vehicle whose position is required on the web page and who is needed to monitor at real time would make use of this proposed system. Also if the vehicle's speed goes beyond the specified limit of the value, then also a warning message will be sent from system to the owner mobile. All this information is stored on the web page at client or owner side. This system also features main attractive part that is an automatic high beam and low beam headlight system. System also uses anti-theft system, it provides security before someone tries to steal it. The main purpose of a system is that it should be easily installed and there should be future scope for the improvement.

Keywords: *Embedded System, Raspberry Pi, GSM*

INTRODUCTION

In this hectic life of human being, transportation is very a rare thing. A lot of accidents occur on the road every day. Hence the necessity of security and monitoring is required. To resolve these problems, a system is designed and developed using GPS and GSM technologies and webpage is created for monitoring.

We face the following problems:

1. Confusion of deciding what to do in critical conditions (if vehicle is stolen)
2. If we have to keep eyes on something very expensive and important
3. How to find the shortest and traffic free path The proposed system overcomes all these problems.

Hence there is necessity of tracking and monitoring a vehicle in real time also updating and storing data of some conditions on web page which should accessible by owner of vehicle. The proposed system is fully automated tracking and monitoring system which is

useful for owner to track and monitor his or her vehicle. It also provides accurate arrival time at particular location or stop. The system is very useful for school bus as system provides accuracy in time, so that students are able to study, sleep and relax more than waiting for a delayed bus. Effective time management is possible for student due to saving in time. This system is also useful for transport business as it can track many vehicles of the company at same time and keep records of each vehicle of the company.

This system reduces use of man power and money. The proposed system gets tracking information of the vehicle such as vehicle number (Unique ID), location, speed, Date, Time and stores into the database of Raspberry Pi. For tracking the vehicle using GPS and maintain its database, MySQL database system is used, which is the advanced feature of Raspberry-Pi.

In the database monitoring and updating mechanism, the GSM/GPRS module is used to transmit the vehicle information to the server and user access the database using web page. This will show the real time vehicle presence or location. In this system if speed goes beyond the specified limit then alert message will be send to the owner. System also proposes Automatic

high beam low beam headlight system for safety purpose. As both side drivers can easily and safely drive. System also uses anti-theft system, it provides security before someone tries to steal it. It is very user friendly, easily installable and accessible system. It is used to track and monitor a vehicle at anytime and anywhere required.

EASE OF USE

System Objectives:

Continuously monitoring and tracking the vehicle at real time using web page.

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 or in case of vehicle's accident. Also sending alert message to owner if speed goes beyond specified limit.

Using automatic high and low beam headlight system for driver's safety.

Using anti-theft system, it provides security before someone tries to steal the vehicle.

The proposed system use microcontroller and also GPS-GSM device. GPS receives the coordinates from the satellites and this is used for getting the location of the vehicle. GSM modem uses a SIM card, have the same communication process as we are using in regular phone. Speedometer will be input to the system and also LDR for detecting light from vehicle at other side is input to the system. System provides output as anti-theft system. Automatic high and low beam headlight is also the output of the system. After installation, system will locate target by the use of a Web application (HTML based application). Power supply will be required to the system or we can say to the Raspberry pi as well as to the other components. Adapter will be used as power supply to the Raspberry pi and for remaining components which will be on PCB.

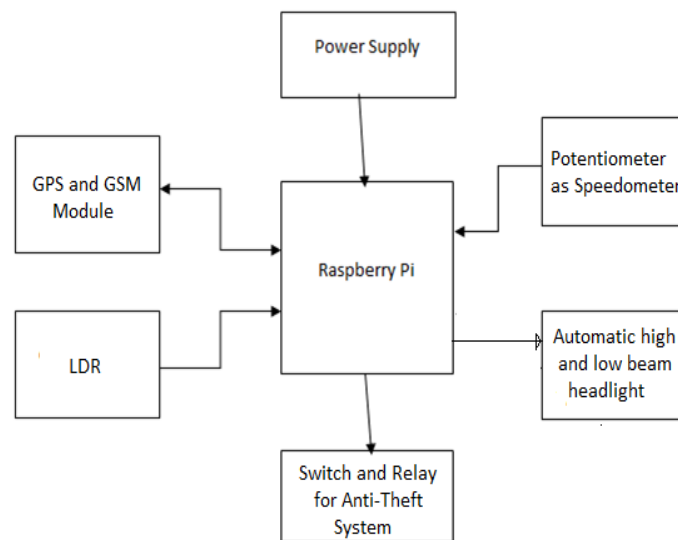


Figure 1: Block Diagram

System Specification

a. Power Supply

Raspberry Pi runs on 5V supply, so we are using 5V 2A adapter to power up Raspberry Pi and display.

b. Raspberry Pi

- Raspberry Pi is heart of this project.
- 1.2GHz QUAD Core Broadcom BCM2837 64bit ARMv8 processor
- On board WiFi- BCM43438
- On board Bluetooth Low Energy (BLE)
- RAM- 1GB
- 4x USB 2 ports
- 40pin extended GPIO
- It has RCA and HDMI video output

c. Potentiometer

Speedometer input is used to measure speed of vehicle. We are using a potentiometer to input the speed of vehicle.

d. MPC3202

- It is analog to digital converter IC
- It is 12-bit analog to digital converter
- Analog inputs programmable as single-ended or
- Has pseudo-differential pairs
- Sample and hold circuit is available on-chip
- SPI Serial Interface of Modes 0,0 and 1,1
- It works on supply of 2.7V-5.5V
- 500 nA typical standby current, 5 μ A maximum
- 550 μ A maximum active current at 5V

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- It works on industrial temperature range of -40°C to +85°C
- 8-pin MSOP, PDIP, SOIC and TSSOP packages

e. LDR

LDR is Light Dependent Resistor

It is used to detect the light coming from front vehicle for automatic upper dipper system.

f. SIM808 GSM/GPRS Module

Power: 3.4V~4.4V **Frequency Band:** SIM808 Quad-band: GSM 850, EGSM 900, DCS 1800, PCS 1900.

Transmitting Power: Class 4 (2W) at GSM 850 and EGSM 900. Class 1 (1W) at DCS 1800 and PCS 1900 **GPRS Connectivity:** GPRS multi-slot class 12 GPRS multi-slot class 1~12 **Temperature Range:** Normal Operation -40°C ~ +85°C **Storage Temp** -45°C ~ +90°C

g. Switch

Switch is used to change relay's state from on to off and vice-versa.

This is used to make the ignition on and off.

h. Relay

Relay is used make the ignition on and off.

It is operated by switch means its state is changed using switch.

System Design

Vehicle real time tracking using module

SIM808 GSM/GPRS/GPS:

SIM808 GSM/GPRS/GPS module interacts with Raspberry pi gives the real time tracking information such as Date, Time, Latitude and Longitude of the vehicle. This information related to the vehicle is stored in the database of raspberry pi and shared on the web page which is accessed by the owner of the vehicle as shown in figure 3.

Sending alert message to owner if speed of vehicle goes Specified limit using SIM808 module:

SIM808 GSM/GPRS/GPS module is also used to send alert SMS to owner if speed of vehicle exceeds specified limit as shown in figure 2. Speed value of vehicle is also stored in database of raspberry pi and shared on web page. Potentiometer is used as prototype to vary the speed value of vehicle at input side.

Automatic high and low beam headlight using LDR and LEDs:

LDR i.e. light dependent resistor is used for detecting light from other side of vehicle. If light is far from LDR then high beam is automatically become on and if light is near to LDR then low beam is automatically become on. At output side yellow LED is used to indicate high beam as shown in figure 4 and green LED indicates low beam as shown in figure 5.

ADC IC MPC3202 is used to convert analog values from LDR and potentiometer to digital values and them

are provided to raspberry pi for further process at input side.

Anti-theft system using relay and switch:

Relay and switch is used to lock the ignition system of vehicle to avoid robbery of vehicle. Switch is used to make relay on and off and relay is to make ignition on and off. When red LED is on then it indicates relay is on means ignition system is on as shown in figure 4 and 5. When red LED is off then it indicates relay is off means ignition system is off.

RESULTS AND DISCUSSION

Speed Limit Crossed.

Figure 2: Alert Message is sent to Owner That Speed is Crossed beyond Specified Limit

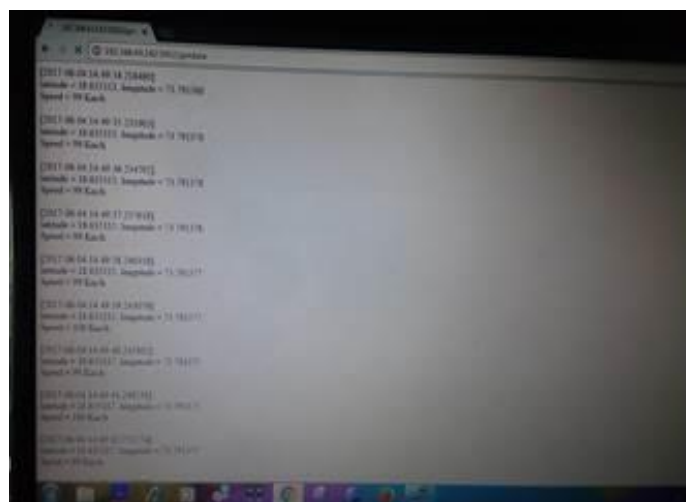


Figure 3: Web Page showing Date, Time, Latitude and Longitude Values and Speed of the Vehicle

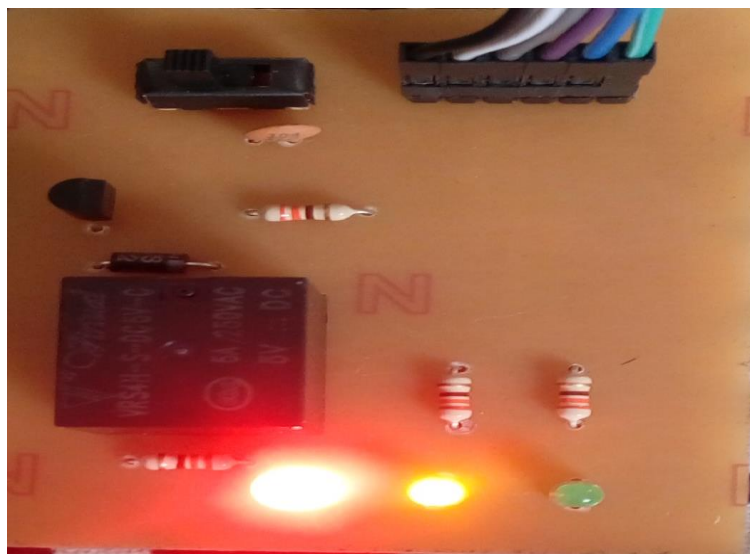


Figure 4: Red Light Indicates Ignition is ON and Yellow Light Indicates High beam



Figure 5: Red Light Indicates Ignition is ON and Yellow Light Indicates High beam

CONCLUSION

The proposed system is best for the Vehicle Tracking and monitoring many conditions of vehicle from remote location at any time using GPS-GSM and many components as well as Web Application (HTML Based) for storing database. As it provides current location and speed of the

vehicle at any time, it is easy to keep records of vehicles of any time. By considering safety it is very good system as it uses Automatic high and low beam headlight system as well as it provides security if someone tries to steal the vehicle. This proposed system is much better evolution than other system present

already. Also in future we can add many V. functions as per our requirement.

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