

Article

Smart Vehicle Computerization System

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A B S T R A C T

In today's world as the population increases the number of vehicles is also increasing rapidly which results in many road accidents. If such accident occurs the system should also able to notify owner or its relative about accidental report.¹ It also leads owner or its relative to face problem afterward, which becomes difficult to track or locate.² The main issue regarding the vehicle is its time to time servicing has become difficult to remember. It is also difficult to monitor tyre pressure in our day to day life^{3,4} to regularly check oil level in vehicle's engine, so to avoid this problem we are developing this system. In this paper we are going to implement a system which will leads to solution to all this problem. The proposed system will also be able to notify to owner or its relative about vehicle accident and its crash report that too real time. Also, to track and locate vehicle, along with real time monitoring and notifying to owner about fuel level, engine oil level, tyre pressure. All this notification will be sent to the owner or its relatives through android application.

Keywords: GPS, GSM, Arduino, Bluetooth HC-05

Introduction

In our day today life, due to our busy schedule human beings are not able to remember to maintain their vehicle. So, to avoid this problem we are developing an android application which will give notification about the maintenance of the vehicle. In the android application owner should register their vehicle to get all the notification and afterward vehicle's real time status like the fuel/ oil, real time location tracking and tyre pressure monitoring can be view by the owner using the android application. The main parts of the proposed system are MEMS, Accelerometer sensor, motion sensor, proximity sensor, infrared sensor, GPS, GSM, Arduino. If any accident occurs, this wireless device will send a message to Emergency Medical Services (EMS) and owner and its relative by giving the exact position of the spot where the crash had occurred. So, they can provide proper medical treatment to patients. This system is used to record information related to accident like position data etc. So that it can be used to analyze the accident easily and to settle many disputes related to accident such

as insurance settlements. The whole system is based on arm controller. This controller is used to correlate all the activities in the system.¹

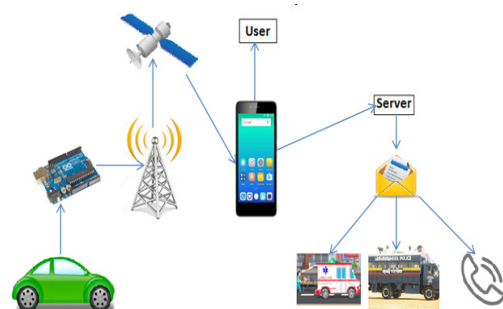


Figure 1. Accident Detection

The system contains fuel level sensor used for detecting the fuel level in fuel tank. The Ultrasonic sensors operated by transmitting sound waves then it will be reflected from the fuel surface and are received by the sensor. Then sensor will calculate the time interval between the transmitted

and received signals, then according to time interval system will convert into distance measurement with the help of electronic circuits within the sensor and measuring the level of the fuel. Then according to the set threshold value, if the fuel level is less than the set threshold value the system will send a notification to the owner. This notification will be sent over an android application to the owner or driver.⁴

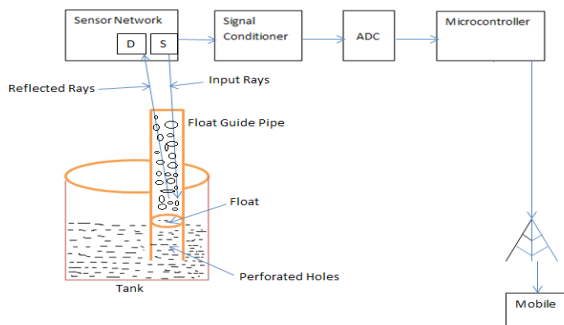


Figure 2. Fuel Level Detection

The one more functionality of the system is it will also able to monitor the pressure within the tyre and if the pressure goes down below the threshold value the system will notify to owner or driver similarly like fuel monitoring system. This functionality will help or prevent many incidents like the control can be loosed from vehicle, or vehicle may not run properly also the driver can't be able to reach the destination within the expected time.⁵

In the previous papers all the modules were developed separately which become difficult for the owner to maintain the modules and due to which the cost also increases. The main motive to develop this system is to reduce the human efforts which is required to maintain the modules separately. So we are combining all the modules in one module, so it will be feasible for the owner to maintain the vehicle.⁵

System Analysis

Arduino based circuit is designed for tracing the location of vehicles. Most of tracking systems are made by using GPS and GSM skill. This is very modest and inexpensive. Tracing systems are mostly used for tracking a vehicle location, routing and others. This is a very decent method for avoiding our vehicles from theft or fraud incidents.⁶ This tracking system sends us the geographical coordinates and by using these coordinates we can track our vehicle location or position on electronic maps using internet. By using these tacking systems, we can share real time information about transportations. And it can be share real time information or position of vehicles.⁷

In this system we are by means of the GSM and GPS module for sending the coordinates of vehicle on mobile phone via message. GPS is sending the coordinates continuously in the form of data. After using Arduino extract the required

data then sends it to mobile phone using GSM module via SMS. GPS used the satellite for tracking the location of any vehicle.⁸

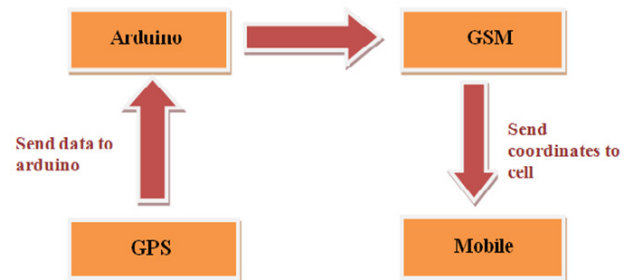


Figure 3. Block Diagram of Arduino based Vehicle Tracking System

Design Methodology

In that System may consist of hardware part as well as software part. Hardware part is used for sensing number of fuel level, oil level, tyre pressure and accident detection and used for communication of data processing whereas software part is used for the representation of data. In that system mostly consists of 3 modules specifically embedded system module, GSM communication module and GPS tracking module. This assembly is similar to the one presented in.^{5,7} The four module contains fuel level with a microcontroller which is placed in each fuel tankers to detect the number of litres or level of fuel and to interact with the GSM communication network.

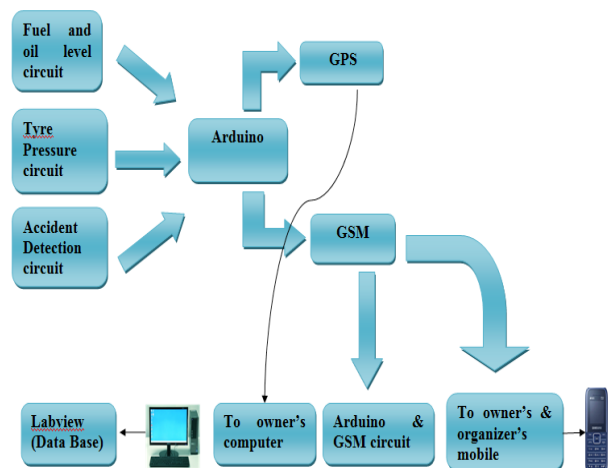


Figure 4. Block Diagram

The embedded system module acquires info from the fuel level, Tyre pressure, oil level and accident detection to maintains record and sends messages to the monitoring agents over communication module. The GPS tracking module is used for the real time tracking system.⁹

System also offers the suggestion of the fuel level, when fuel level is high then message should be showed on the LCD screen as "FUEL: HIGH" as shown in Figure 5.



Figure 5.Fuel level detection-High

When fuel level goes low then the system will display the message as “FUEL: LOW” with the indication of fuel level temperature also measured and displayed as shown in Figure 6.



Figure 6.Fuel level detection-Low

To avoid situations like accident system provides alert to the driver to drive safe and sound for safety of all passenger and driver as shown in Figure 7.



Figure 7.Accident detection



Figure 8.Tyre Pressure Detection

Every time driver or any other vehicle users will not check the condition of tyres. Conditions like air pressure in the tyres etc. When air pressure goes low may cause some critical conditions and driver will not recognize immediately

about this condition, so system provide puncture detection facility. When air pressure goes low then system display the message on LCD Screen as “Air Pressure is Low” as shown in Figure 8.¹⁰

Hardware Requirement

Microcontroller:- This section forms the control unit of the whole project. This section basically consists of a microcontroller with its related circuitry like crystal with capacitors, Reset circuitry and so on. The microcontroller is the central part of the project because it controls the devices being connected and communicates with the devices according to the program being written.

GSM Module:- Global System for Mobile Communiqué is a digital mobile telephone system that is typically used in numerous parts of the world. The mobile communication has established solitary of the driving forces of the digital revolution. Each day, millions of people are manufacture phone calls by pressing a few buttons. GSM (Global System for Mobile communication) is a digital mobile telephone system that is extensively used in many shares of the world. GSM uses a alteration of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compact data, then sends it down a channel with two other streams of user data, each in its own time slot. GSM functions in the 900MHz, 1800MHz or 1900 MHz frequency bands. GSM has been the sustenance of the remarkable achievement in mobile telecoms over the former decade. Presently, at the dawn of the era of true broadband services, GSM continues to evolve to encounter novel demands. One of GSM's excessive strong point is its international roaming capacity, giving consumers a seamless service.¹¹ This has been a vigorous driver in spreading, with around 300 million. In the Americas, today's 7 million subscribers are set to increase rapidly, with market prospective of 500 million in population, due to the introduction of GSM 800, which allows users using the 800 MHz band to have admission to GSM skill too.

GPS Module:- Global Position System(GPS) is a space-based satellite navigation that gives location and time information in all weather conditions, any place on or near the Earth. The framework gives basic abilities to military, communal and business clients as far and wide as possible. A GPS tracking unit is a device that uses the Global Positioning System to consider the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at constant intervals.

Arduino:- Arduino is an Open-Source integrated circuit technology platform founded on user friendly hardware and software. Arduino boards are intelligent to read inputs-

light on a sensor, a finger on a button, or a message-and turn it into an output-activating a motor, revolving on an LED, publication something online.

Tyre Pressure:- The smart pressure device SPD sequence of the pressure sensor are silicon based and enclose in modified plastic Dual in packages. Various pressure ranges are available. Its voltage is typical 5V. It is preferably suitable for microprocessor and microcontroller-based system.

Air Compressor:- An air compressor is an apparatus that interpret power into potential energy store in under pressure air. By one of numerous methods, an air compressor forces more and more air into a storage tanks, growing the pressure. When tank pressure influences its threshold value the compressor shut off.¹²

Bluetooth HC-05:- HC-05 Bluetooth is a wireless statement protocol; it is used in dual devices as a distribution and collecting the information. The Bluetooth is allowed to use in the wireless communication protocol as the variety of the Bluetooth is a smaller quantity than the other wireless communication protocols like wi-fi, zigbee. The Bluetooth function at the frequency of the 2.41GHz and also used in additional small ranges of requests.¹³

Mobile Accelerometer:- An accelerometer is a sensor which procedures the tilting motion and orientation of a mobile phone. The accelerometer is used to safeguard photographs are obtainable in the current way-portrait or landscape-depending on the way the phone is detained. Accelerometer are also increasingly used as a income of user input, greatest outstandingly in games where tilting and rotating the handset can control on screen action.

Conclusion

It has been realized that the smartphone-based vehicle accident recognition system is not an informal task to lever. It is actually enclosed with many obstacles that prevent the researchers from getting 100% accurate detection system. One of the chief obstacles; is to grip the modules distinctly. The planned system minimizes the impression of this obstacle by developing vehicle tracking system. In vehicle tracking system Smartphone provides exact location of the vehicle by giving a notification. Specifically, the system will utilize GPS to obtain a vehicle's coordinate and transmit it using GSM modem to the user's phone through the mobile network. The system implies fuel sensor for detection for fuel, tyre pressure detection unit, oil detection, accident detection unit & tracking. All the information will be conveyed to the user server via GPRS & GSM. This information is recorded in database so user can recover the current & past status any time.

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