International Journal of Advanced and Innovative Research (2278-844)/

Volume 7 Issue 9

A Survey on Remotely Monitoring the Vehicle Parameter through IoT Protocol

Ruchi Dronawat , Upasana Shrivastava
Department of Computer Science
Sagar Institute of Science and Technology, Bhopal (M.P)

ABSTRACT

By using the Internet of Things Technology can greatly enhance the performance, monitoring and maintenance of the vehicle. In this paper analysis is based on the Implementation of new cost effective methodology based on IoT to monitor vehicle health remotely for performance evaluation. This will facilitate preventive maintenance, fault detection, historical analysis of the vehicle in addition to real time monitoring. In this paper we review the different vehicle parameters via remote monitoring system.

In this paper analysis system take care of the safety by different parameter heating, avoiding engine damaging, drinking alcohol to find the status of the driver & vehicle location.

Keywords

IOT (Internet of thing), GPS/GSM/GPRS, CAN (Controller Area Network), Sensor.

1. INTRODUCTION

Mobile data systems are getting cheaper and more widespread each year. People are staying online longer than before, which opens up tremendous possibilities for projects related to the Internet of Things (IoT) [1]. Around 47% of the world's population is already using the Internet [2] and by 2020 it is foreseen that the number of devices connected to the Internet will be over 50 billion [3].

As wireless network technologies going one step ahead day by day, internet-connected mobile devices such as smart phones and tablets are now in widespread use. Thus resulting in a new concept, Internet of Things (Iot), was introduced and has received attention over the past few years. IoT represents a system which consists a thing in the real world, and sensors attached to or combined to these things, connected to the Internet via wired and wireless network structure. The IoT sensors can use various types of connections such as RFID, Wi-Fi, Bluetooth, and ZigBee, in addition to allowing wide area connectivity using many technologies such as GSM, GPRS, 3G, and LTE. IoT-enabled things will share information about the condition of things and the surrounding environment with people, software systems and other machines. by the technology of the IoT, the world will becomes smart in every aspects, since the IoT will provides a means of smart cities, smart healthcare, smart homes and building, in addition to many important applications such as smart energy, grid, transportation, waste management and monitoring [1] .

With the advent of development of IoT (Internet of Thing) technology, the automotive field has undergone drastic changes in terms of customer comfort and safety. The structure of vehicles has become more complex. Increased degree of automation has been incorporated in the design of the vehicle. Significant safety features have been added at lower costs. Now a day, the focus is on vehicle interior network application and the wireless data transmission technology. This system is based on the widely used CAN bus technology. Therefore vehicle interior network came into existence. CAN (Controller Area Network, CAN); relying on its stability performance, low price and high reliability and real-time, has now been widely used in automotive internal network[2]. GSM and GPRS technology are used for sending this real time information of vehicle status when any abnormal faults are detected to remote location for performance evaluation and monitoring. The GPS system will provide location and time. GPS provides accurate location and time information for an unlimited number of users in all weather, day and night, anywhere in the world. It has the advantages of a wide coverage, high accessing speed, charging according to the flow rate. This has influenced us to remotely monitor the critical parameter of vehicle based on IoT(internet of things) technology. This paper mainly focuses on remotely monitoring the vehicle parameter based on CAN bus through web application by using IoT technology, which can be used to improve the efficiency of monitoring, to maintain the system security, to lower the maintenance costs as well as the operating costs

The paper is organized as follows: Section II presents Internet of Things (IoT). Section III GPS/ GPRS sytem. Section IV present a proposed IoT based Vehicle health data logging and monitoring. Section V presents the overall design of the system. Working of the system is presented in Section VI. Section VII present future work to be done. The paper is concluded in Section IX.

2. Related work

These are some author done work related to the vichele monitoring system

In this Paper author Proposed "a driver behavior analysis tool and an in-vehicle sensor data monitoring system are presented. The study offers a system based on low cost hardware and advanced software capabilities. The embedded system utilizes the information provided by in-car sensors using the Controller Area Network (CAN), an Inertial Measurement Unit (IMU) and a GPS. By combining this information, the driving performance and driving characteristics are determined "[1].

In this Paper author Proposed "an advanced vehicle onitoring

and tracking system is proposed and designed for the purpose of monitoring the vehicles which are moving from one place to the other in order to provide safety and security. The proposed method puts together superior exercise of contemporary technology by means of Embedded C programming language and the unit developed via LPC2148 and its sophisticated features of storing database. The work includes Global Positioning System (GPS) and Global System for Mobile Communication (GSM) for vehicle tracking and monitoring purpose using SIM800 module. The GPS provides present site of the vehicle; GPRS sends the tracking information to the server and thus an alert message generated is transmitted to the owner of the vehicle. "[2].

In this Paper author Proposed "a threshold based fault detection and repairing scheme using a Dynamic Bayesian Network (DBN) model, which can obtain the temporal and spatial correlations of vehicle data for accurate real-time or history fault detection and repairing. In addition, we give an algorithm of how to select the threshold to achieve the best effect by history data before fault detection and repairing process. Finally, simulation results show that the proposed scheme possesses a good fault detection and repairing accuracy as well as a low false alarm rate compared to other available methods"[3].

3. Problem Formulation & Solution

3.1 Problem formulation

In the Literature survey, We are analyzing the several problems like location of vehicle, engine burst information ,engine temperature, fuel & Battery consumption analysis information about the condition of the driver such as, Drunk or not drunk. With these some problem are not define previous work .Hence we are proposing the work smart vehicle monitoring system form removing these problems.

3.2 Proposed system

The main contributions of this paper are summarized as follows.

- In this Proposed work is to monitor the critical parameter of vehicle system through an IoT based network in order to control it remotely. The information from the sensors is transmitted via the mobile radio network. The vehicle consist of onboard GPRS module which collect the CAN data from the CAN device fitted on the vehicle and send it to the remotely located server.
- In this Paper Proposed Monitoring the temperature of the vehicle system avoid sparking of the vehicle and also providing the fuel consumption & Battery information of display.
- In this Paper Proposed using of GSM Module when vehicle is provide the unusual activity & driver is facing any problem then it give message to the owner of vehicle.
- In this proposed IoT system that allows the owner to monitor the data provided by the sensors available on a vehicle, and to control processes automatically, anytime and anywhere using cloud system analysis.

4. Proposed System Architecture

The proposed conceptual system in this work is to monitor the critical parameter of vehicle system through an IoT based network in order to control it remotely. The information from the sensors is transmitted via the mobile radio network. The vehicle consist of onboard GPRS module which collect the CAN data from the CAN device fitted on the vehicle and send it to the remotely located server.

IoT application block diagram for remotely monitoring the vehicle parameter is shown in figure 4. The diagram consist of three stage starting with the on board unit which will collect the sensor data from vehicle networks through I/O Module (input/output Module) or CAN (controller area network) controller.

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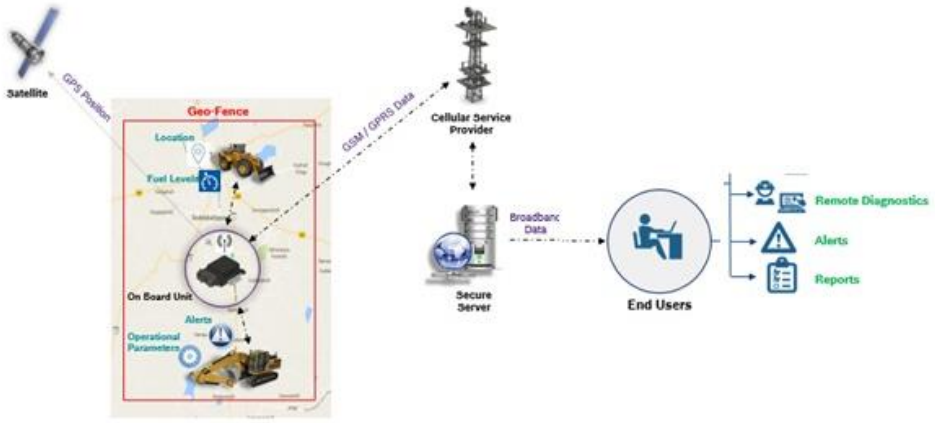

Fig 1: Block diagram for remotely monitoring the vehicle parameter

4.1 Internet of Thing(IoT)

IoT technology is the interconnection of different networked embedded devices used in the everyday life integrated into the Internet. It aims to automate the operation of different domains such as home appliances, health care systems, security and surveillance systems, industrial systems, transportation systems, military systems, electrical systems, and many others. In order to achieve a fully automated process, devices in the different domains must be equipped with micro-controllers, transceivers, and protocols to facilitate and standardize their communication with each other and with external
entities.

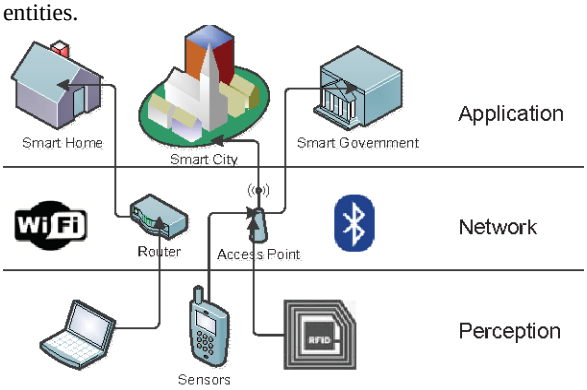

Fig.2. Architecture of IoT (Internet of Things)

IoT system is composed of three layers: the perception layer, the network or transmission layer, and the application layer as shown in Figure 1. The perception layer includes a group of Internet-enabled devices that can percept, detect objects, collect systems information, and exchange information with other devices through the Internet communication networks. Sensors, Global Positioning Systems (GPS), cameras, and Radio Frequency Identification Devices (RFID) are examples of devices that exist at perception layer. The network/transmission layer is responsible of forwarding data from perception layer to the application layer under the constraints of devices' capabilities, network limitation and the applications' constraints. IoT systems use a combination of Internet and short-range networks based on the communicated parties. Short-range communication technologies such as Bluetooth and ZigBee, CAN (controller area network) are used to carry the information from perception devices to a nearby gateway. Other technologies such as WiFi, 2G, 3G and 4G, carry the information for long distances based on the application. The upper layer is the application layer, where incoming information is processed to induce insights upon which we can design better power's distribution and management smart cities, power system monitoring, vehicle health strategies. Applications aim to create smart homes, smart cities, power system monitoring, vehicle health monitoring, demand-side energy management, coordination of distributed power storage, and integration of renewable energy generators [3].

4.2 GPS

A GPS consists of three discrete parts as it is shown in the following Figure 2. These three parts are: the satellites in orbit, the ground control stations, and the users (satellite receivers found in land, air, sea). For the part of satellites in orbit, twenty-four (24) satellites are in orbit, of which twenty to twenty-one (20–21) are in operation. Four (4) from these 21 satellites are visible at any time from any station on earth. The vertical and horizontal position for each specific station is feasible to be obtained in the form of X, Y, Z coordinates (position vector). The information concerning the speed (

dt/dx , dt/dy , dt/ dz) of a vehicle, airplane, ship etc. is also available all over the world, at any time, and under all weather conditions. Ground control station consists of master control station, monitoring station and injecting station.

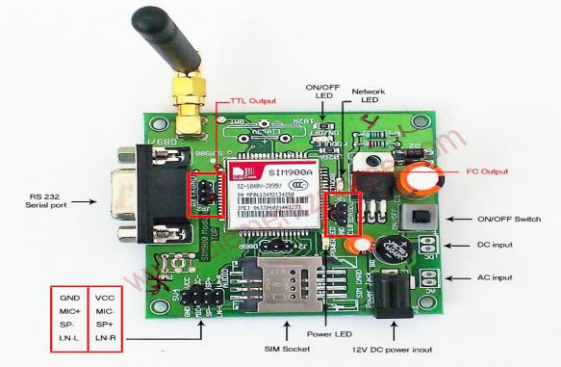

Fig.3 GSM Module

4.3 GPRS

The general packet radio service (GPRS), a data extension of the mobile telephony standard GSM, is emerging as the first true packet-switched architecture to allow mobile subscribers to benefit from high-speed transmission rates and run data applications from their mobile terminals. It is a GSM based wireless packet switching technology, providing end to end and wide-area wireless IP connectivity, whose purpose is to provide packet based form of data services for GSM users. GPRS provides high-speed wireless IP services for mobile users, fully supports the TCP/IP, dynamically allocates IP addresses for the mobile sites and achieves mobile Internet functions, accessing to the Internet through GGSN. Any kind of business in the fixed Internet will also be able to be achieved through GPRS mobile networks. Two new network nodes GGSN and the SGSN are introduced for transmission and reception of GPRS data packets. Node GGSN is a gateway connecting GPRS network with external data network, by which GPRS packet data packets can be performed protocol conversion, so these data packets can be sent to a remote TCP/IP[4].

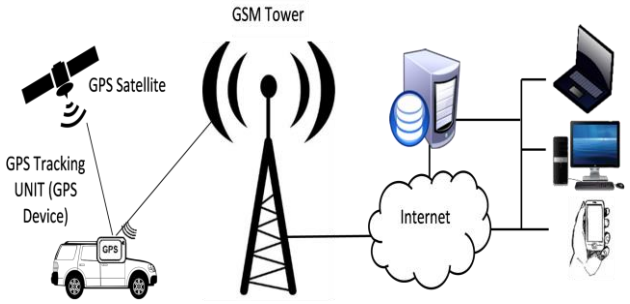

Fig.4 GPRS Concept

5. SYSTEM DESIGNING

5.1 Overall System Design

The data acquisition system is capable of acquiring the values for Battery voltage, Engine oil pressure, Engine oil temperature, Engine water temperature, Transmission oil temperature, Transmission oil pressure, fuel level through sensor fitted on the vehicle. Battery Voltage is sensed using voltage divider circuit. Engine oil pressure and Transmission oil pressure are sensed by voltage or current output type pressure sensor. Engine oil Temperature, Engine water temperature, Transmission oil temperature is sensed by resistance type temperature sensor whose resistance will vary according to the temperature range. Fuel level sensor is also sensed by resistance type level sensor.

All the parameter value to be monitor will receive by input output module which will convert this analog data from the sensor, in form of CAN message. This CAN data from the I/O Module is collected by the On board unit which is compatible to GPS, GSM/GPRS system.

The On board GPS/GPRS unit transferred parameter value to the remotely located server. The data will be store in local database. The stored data can be retrieve through web based application. The web based application page is also use to continuously monitor all the parameter remotely. Through web application page numbers of vehicle can be monitor simultaneously.

5.2 Working of the System

The major role of data logging system is to send data through the GPRS enabled modem. Modem should perform these commands as soon as it receives them. A standalone web hosting service running on the target PC gives a facility to monitor the live data from anywhere in the world if having an internet connection. Log data file may be directly accessed or the data in the log files may be seen at user-interface webpage. Webpage resources should be programmed to ‘auto refresh’ of data displaying section of webpage at a fixed interval.

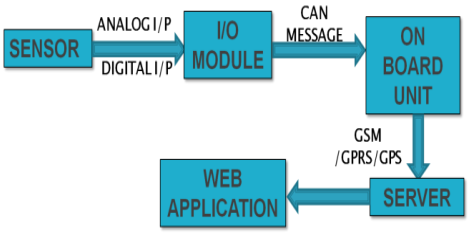

Fig.5. System design

All the parameters of the vehicle are continuously monitor through webpage. The parameters have a predefined operating range. When any one of the above parameter value deviate from it predefined operating range then the respective parameter of the particular vehicle turn into red color giving alert to the service person. This will help in to reduce the maintenance and operating cost of the vehicle.

6. CONCLUSION

Use of IoT for monitoring of a vehicle parameter is an important step as day by day large number of vehicle populated on road. Thus monitoring of vehicle parameter will enhance future decision making process for easy operation and maintenance of the vehicle. In this paper we proposed an IoT based remote monitoring system for vehicle parameter, the approach is studied, implemented and successfully achieved the remote transmission of data to a server for supervision. IoT based remote monitoring will improve energy efficiency of the system by making use of low power consuming advanced wireless modules thereby reducing the carbon foot print. Web Console based interface will significantly reduce time of manual supervision and aid in the process of scheduling task of vehicle.

7. FUTURE WORK

The uniqueness of the proposed system is that it will be easier to monitor the parameter of the vehicle in a holistic level .The IoT based system will populate dedicated web server based database with real time monitoring of the vehicle parameter that will enhance the decision making process of the concerned authority, thus reducing the breakdown time of vehicle.

This system can be further equipped with GPS modules for tracking vehicle locations when deployed in large number that will further enhance the operation and maintenance of the vehicle in real time.

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