

SMART VEHICLE AND CONNECTIVITY USING IOT

Shaikh Mohammad Tarique¹, Rohan Shelke², Mohd Hadi³, Ayush Ranjan⁴, Manoj Singh Adhikari⁵

^{1,2,3,4,5} Dept School of Electronics and Electrical Engineering, Lovely Professional University, Punjab, India

Abstract: Nowadays, with the expeditious growth within the number of automobiles on roads in modern cities, the quantity of cases of traffic rules violation and of the road accidents are rising. most of the person are using their own vehicle to drive from one place to a different. In this paper we present tyre monitoring system and Laser base vehicle monitoring system with use of Internet of Things. irregular tyre pressure may be a security concern that's usually neglected. But the truth is that irregular tyre pressure may give bad mileage or reduce the tyre life and overall, it can reduce the vehicle performance. This research paper is all about changing the concept of current technology used for vehicle tyre pressure monitoring as it will warn the driver about condition of tyre pressure and it's temperature by using LEDs near the driver cabin by taking continuous measurement through the sensor and also it will use Laser based vehicle monitoring system to detect and to get the shape of the moving object by using laser radar and image processing technique.

IndexTerms - TPMS, LBMS, IoT, Wireless sensor network, Intelligent Vehicle, Laser Radar, Data Fusion.

I. INTRODUCTION

As 1214 road crashes occur every day in India according to source and there is one death every four minutes due to a road accident in India. And most of the accidents caused by the failure of tyre or because of fog. So, that is why we need some smart technologies to prevent these road accidents occurred by tyre failure and fog. And after a lot of research we found that Tyre Pressure Monitoring System (TPMS) and laser-based vehicle monitoring system will reduce the count of deaths of road accidents. Most of the people ignores or not aware of the exact quantity of pressure to be filled in their tyres and tyres remain under-inflated or over-inflated, when they drive the vehicle in that condition then they feel a change in steering stability, handling, breaking and even a change in mileage of the vehicle. And when a accident occurs then tyre pressure plays a big role which user was not aware about. Tyre pressure monitoring system will take care of this by using pressure sensors and giving the warning to the user by using IoT to the LED or a smart phone. Also measure the fuel level and the fuel mileage so it will provide better vehicle handling to the driver and observer.

1.2 Basically, two types of TPMS are: -

A. Direct TPMS:

It is simple and best one because in this we put sensors into the tyre valves with a transmitter which will transmit the warning if required to the receiver which is near the driver.

B. Indirect TPMS:

This is little bit different from the direct TPMS because it is calibrated with ABS's (Antilock Braking system) wheel speed sensor means if one tyre is low on pressure then it will compare it with 3 other tyres and if there is a difference between them in terms of rotation speed then it will send the warning. Similarly, laser-based vehicle monitoring system will help us to get rid of accidents caused by the fog as it detects the object or vehicle in its surroundings. It will detect the object or vehicle and create its shape and according to that driver will get to know what is near him/her.

The concept of the smart vehicle would be the IoT. The Internet of things an ecosystem comprising of the object which is real physical device are linked with the internet. It is connected with the virtual and real. These objects are connected with the different kinds of sensor like Pressure sensor, laser sensor, temperature sensor so on and actuators which passes the data and information to the internet. This technology helps and work in many fields for observation and also helps to the manufacturer so, they take necessary steps before the implementing the new things. The application and methods are shown in Fig. 1.

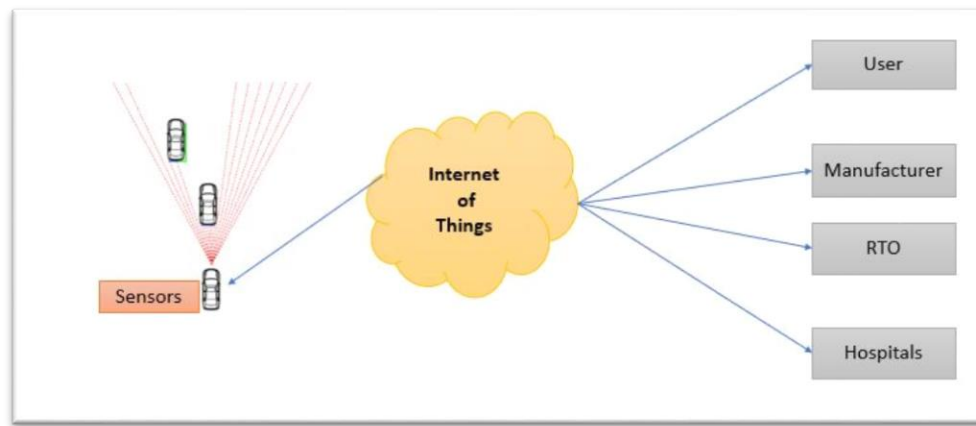


Fig. 1. Applications of Internet of Things

II. LITRATURE SURVEY

here we discussed about the different methods of monitoring and controlling which is related to the monitoring the vehicle is proposed in many approaches. In [1], The Hasan has tyre pressure monitoring system vehicle is user friendly. Also, laser-based vehicle monitoring system is having DATOMO stands for detection and tracking of moving object is used for problem avoidance and activity planning [2,3,4,5,6]. The design was construct using available component and software discussed below. Testing of the vehicle gives the saturate and reliable output data as compare to the market where the system is available in the market, this system having its own advantages and successful benefits. In [7], The FTPMS is set on the vehicle network technologies was implemented in the paper. It is full cycle mapping or tracking system and provides a new output for the maintenance of the tyre and solution. This system can transfer the data which is monitor by the mobile through the internet using mobile. In this data temperature and the fell level as well as pressure of the tyre is present and also vehicle tracking is available. In [8], The microcontroller used as central processing unit (CPU) along with the Global positioning system (GPS) used for tracking the vehicle, Fuel sensor is used for fuel level monitoring, laser sensor is used for laser base tracking and monitoring system and these are communication through the controller respectively. In [9] the presented format and design placed inside the tyre nozzle and the rest all ae placed outside. The laser sensor is placed on top of the vehicle at the centre. The system is uses Radio Frequency (RF) receiver with the display and buttons for the user interface. The [10] This paper is presented as a real time monitoring the traffic system to overcome the traffic which is measure as a real time to control the traffic and monitor to them. This new presented system gives a new way to control all the traffic system and utilize the resources. The traffic control department take the advantage of this and monitor the situation which will not create a huge traffic or dangerous situation on the roads and it will do as an immediate effect. The system is work on the Internet of Things (IoT) which receive and transmit the information, by improvement in the efficiency so it will reduce the cost. The [11], paper work on a real time traffic monitoring system to find out and determine the cause of real-time traffic controlling and monitoring. The advanced system come up with new way of traffic management and control by the superior utilization of resources. The department of traffic administration may use this real time traffic monitoring information system to observe and detect the threatening circumstances on road way and proceed by imposing on the spot action. In this research paper the major role played by internet of things- (IoT) for traffic monitoring by enhancing the efficiency of traffic safety and travelling cost. The [12], report presents kind of strategy of direct tyre pressure monitoring system, please initiate the principle of the system. The transmission or communication are generally enhanced through by choosing carefully the RF module. Researchers show tyre pressure monitoring system has a bright prospect the transmission model having a low power property the FSK technique are used for wireless signal transmission, Manchester coding and CRC check out. The obtaining output result shows that the system is beneficial for future real application as well. The [13] research are implemented and develop novel traffic system which are able to managing and monitoring the urban traffic system. The system is established very flexible and also observed and tested with many situations. The system shows different from others because of new added vehicle sporting feature. The system is use various advanced technology with the IOT. From anywhere we can track the vehicle the system. The developed system in this paper is very reliable and cost effective. In [14] the research paper we study of drivers driving behaviour to avoid various types of mistake which are causes of accident. Also trying to reduce the damage of the least level if the accident is happening. The main job of our system to collect the information given by the system to get the speed of vehicle to reduce such an accident. This patent[15], The development contains two key aspects which are sharing the receiver function with alternative vehicle process to economize on primary overhead as well as upon power supplies and assigning an ID code number to every transmitter and starting a record of the tire position of each transmitter and updating the record when tires are moved, so that pressure data can be related to a specific tire position.

III. ARCHTECTURE OF SYSTEM

Specification design are mentioned in the following table.

Table 1: Specification Design

Sr No	Measured Parameter	Sensor	Range
1.	Tyre Pressure	RKI-2544	0-40kPa
2.	Fuel Level	Optical Liquid Level Sensor	0.1m to 2m
3.	Engine Temperature	LM35	-55° to +155° C
4.	Object Monitoring	LiDAR Distance Sensor	0.1m to 12m

3.1 Block Diagram

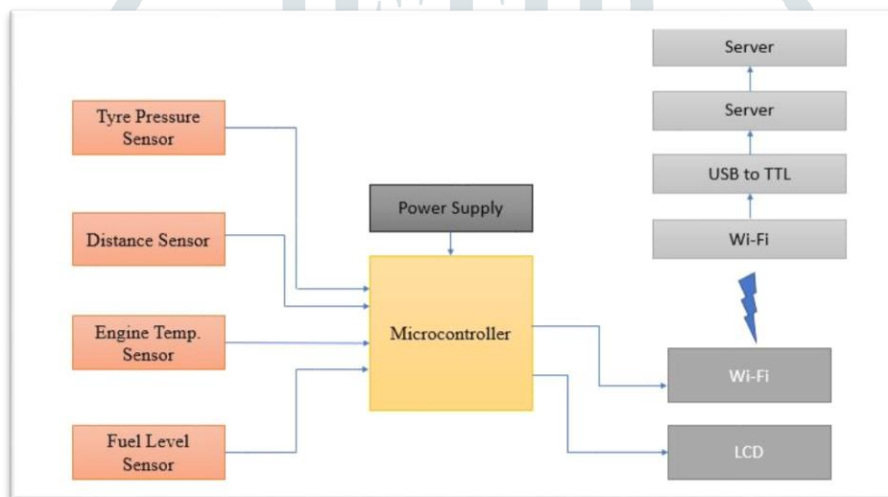


Fig. 2. Block Diagram

- **Microcontroller**

Microcontroller ATMega328 is a small computer IC (Integrated Circuit) which is single chip having so many function and features and memory. This created for the short and related applications. The ATMega328 is having 8 bit. This is based on AVR and RICS architecture. This controller having many features like Digital to Analog and Analog to Digital conversion. An Arduino Pro ATMega328P shown in the Fig. 3.



Fig. 3. Arduino Pro ATMega328P

- **Pressure Sensor:**



Fig. 4. Pressure sensor RKI-2544

A pressure sensor that work to convert pressure into an electrical form or analog electrical signal. This sensor commonly calculate the Gauge Pressure, Differential Pressure and Absolute Pressure. We are using RKI-2544 model as shown in Fig. 4. It is having various features like, it operates in -40°C to $+125^{\circ}\text{C}$ Temperature, The measuring range of this sensor is 0-40kPa. It is very low cost and good temp. range and having high reliability also it uses a MEMS technology.

- **Temperature Sensor:**



Fig. 5. Temperature senso LM35

The LM35 as shown in fig. 5. Is a series of the precision IC's temperature device with the output voltage is linearly proportional to the Centigrade Temperature. This device operating range is -55°C to $+150^{\circ}\text{C}$ temperature. The output is in voltage so, it is easy to calculate the temperature in Celsius. The advantage of this senso is no any external device need for calibration and linear temperature is calibrated in Kelvin so its very easy for user to obtain the convenient centigrade scaling.

- **Fuel Level Sensor:**



Fig. 6. Fuel level Sensor

This fuel level sensor is shown in the fig. 6. Use to detect the fuel level in the tank which is useful for analysis purposes. This is suitable for fast response time and high sensitivity. the measurement will take as soon as possible. Potentiometer is used for adjustment for the sensor sensitivity.

- Distance Sensor:

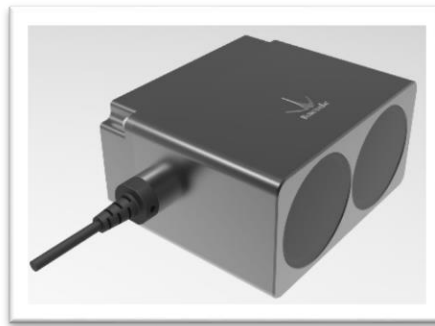


Fig. 7. LiDAR Sensor

This sensor is known as LiDAR sensor as shown in the fig. 7. Stands for Light Detection and Ranging, this is use to determine the earth surface. This is work when the light waves bounce of object and back to the LiDAR sensor. It will calculate each pulses and return to calculate the distance it is also processed 3D visualization knowing as a 'Point Cloud'.

3.2 Software Description:

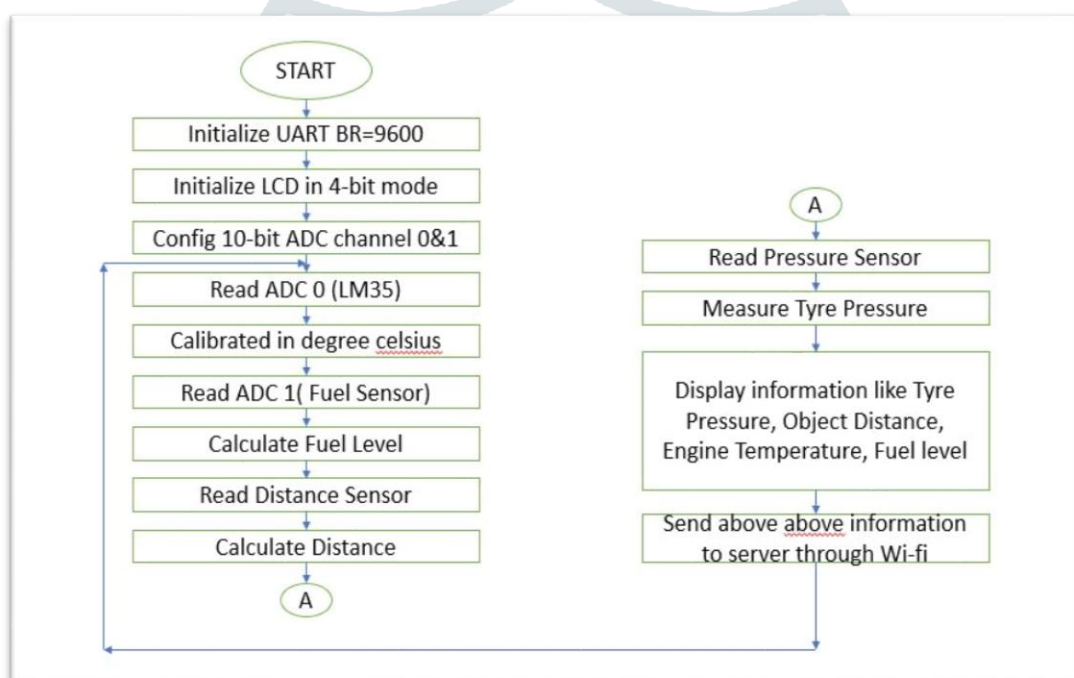


Fig. 8. Flow Chart

IV. SCOPE

This paper looks into the present research happening in certain areas of automation and their effect on relaxation and safety. These two technologies (TPMS and LBMS) are going to boom the market in upcoming days. As electric car's era is coming so these technologies will help a lot to the maker to ease their work. We can advance it in future by using auto pressure filler so that user's time will be saved as it will fill the tyre while in running vehicle.

V. RESULTS

After implementing the direct TPMS in a tyre we found out that when we remove the pressure below the threshold value it automatically gave warning to the receiver end. And also found out a disadvantage of direct TPMS is that if sensor is not mounted carefully then it can damage and if the battery is discharged then you have to open the tyre of the vehicle to change the battery. LBMS was also working fine as it gives the exact distance and size of the object when laser beam pass hit over that.

This Project Model gives all the output of the sensors which is connected to the microcontroller module which placed or mounted inside the vehicle and all the reading transfer to monitoring computer through the Wi-Fi device. All the readings are calibrates in respect to time and unit and display as shown in fig. 9. This system will take the response time 1.10 second.

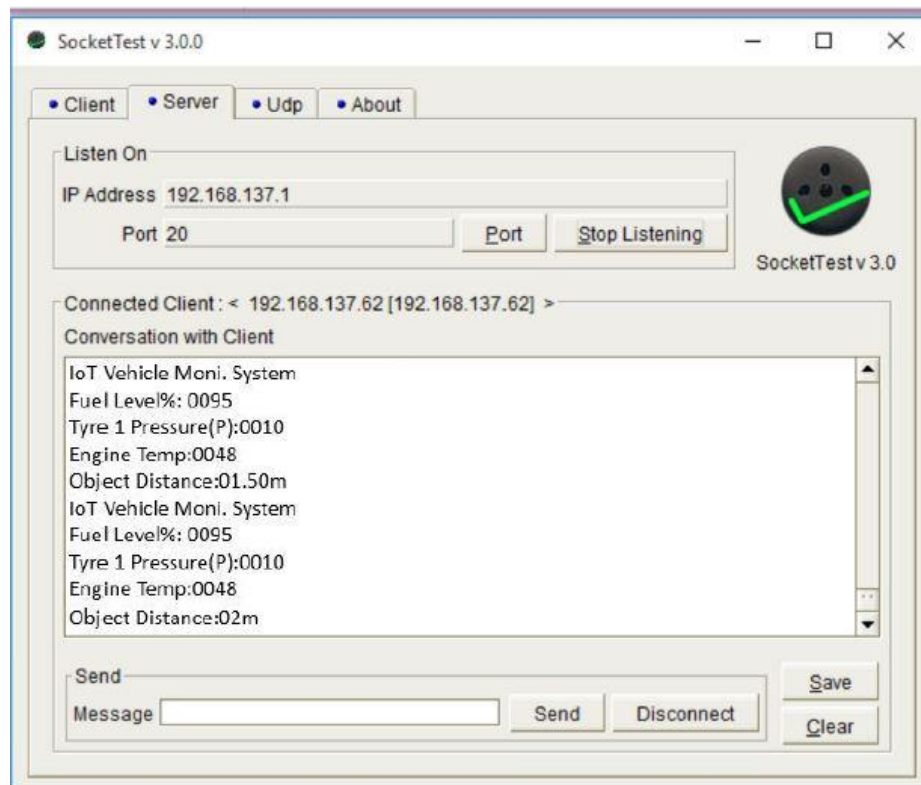


Fig. 9. Result

VI. CONCLUSION

In this research we mainly focused on TPMS as it is something that our future generation will love it. We got to know how many car accidents are happening around the world and most of them was because of tyre failure and fog. Our government are trying to get hard to get rid of these accidents. We learnt about how to implement the sensors and LIDAR on a vehicle which a little bit difficult. We get know practically how laser beam works like by reflecting the rays from the object. After applying this concept, we are sure that It will reduce the number of accidents happening on the road.

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