

# Design an IoT Enabled System for Monitoring Vehicles

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**Abstract:** *The population is increasing at very peak ranges all over the world and deaths are exponentially increasing. Among them most deaths occurs due to accidents. Accidents in vehicles are occurring due to lack of maintenance in vehicle. In our project we are going to overcome some of the demerits of existing system in cars. The proposed system will diagnose the whole car automatically and give the details to the owner of the car. In case of any abnormal condition, it will notify the owner as well as the people inside car.*

**Keywords:** Arduino UNO, Bridge rectifier, Sensor, GSM Module

## I. INTRODUCTION

In the current generation, all the people are majorly dependent on vehicles and need transportation network to move from one location to another. Transportation is nearly a part of human growth from the start of civilization. It is nearly proportional to the growth of the population. The main intention of the project is to completely diagnose the whole car automatically and provide the details to the car owner.

Security, Safety and Comfort are the primary concern while travelling in the car. The existing IoT systems were designed using micro controller boards like PARALLAX Basic Stamp with the help of piezoelectric sensors. The Vehicle Monitoring System proposes use of IoT by way of the use of sensor linked with Arduino UNO to diagnose the vehicle. Each and every parameter like Distance, Engine Temperature, Fuel Level, Speed and Concentration of gas information are monitored and transmitted to owner of car via Message Application. This system is linked with GSM module to communicate through cellular network for messaging services.

## II. PROPOSED SYSTEM

The system is controlled by Arduino UNO. Arduino UNO microcontroller is used to execute our task of getting the information from the sensors and displaying them. The input provided to the microcontroller Arduino UNO are sensors like Gas Sensor, Fuel sensor, Speed Sensor, Temperature Sensor and the Alcohol Sensor. These sensors collect the information from the environment and send the collected information to the microcontroller where the collected information's are stored. Fuel level Sensors helps to measure the level of the fuel in a given volume. Speed Sensors are used to check the speed of the vehicle. The speed is denoted by the rpm of the wheel initiated. Temperature Sensor is used for sensing the temperature of engine of the car. Gas Sensor is used to create an alert to the user if any new composition of gas is created in the surrounding, it will monitor and possess the information. Any sensor value which crosses its limited value then it will create a buzzer alarm.

All these data will be collected by the microcontroller and will be displayed on LCD. With the help of IoT, all the collected information are sent to the owner of the vehicle through the GSM module. The details of the vehicle will be available in the Message page of the owner. The detail will be received by the owner at regular intervals or where any abnormal condition arises.

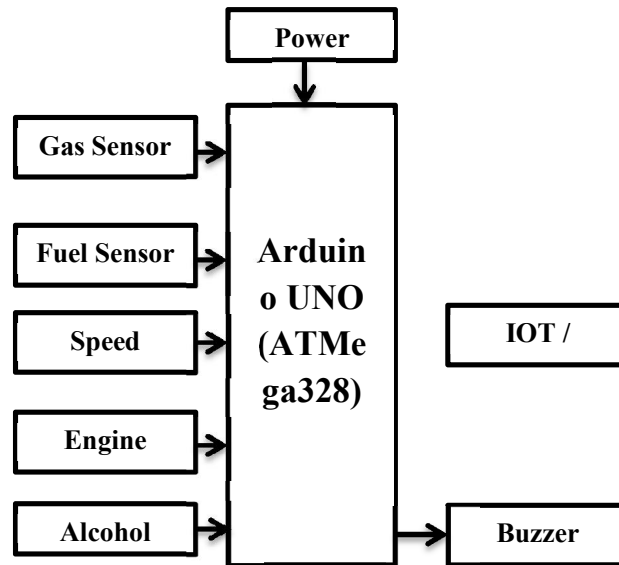


Figure 1: Block diagram of proposed system

### III. METHODOLOGY

#### 3.1 Power Supply

First, we want to generate a electricity deliver that's to be provide the appropriate voltage deliver for their proper functioning, wherein the digital circuits works in DC voltage. This strength supply circuit consists of transformer, rectifier, clear out and regulator. The AC voltage 230voltage is hooked up to a step down transformer to the level to the preferred AC voltage.

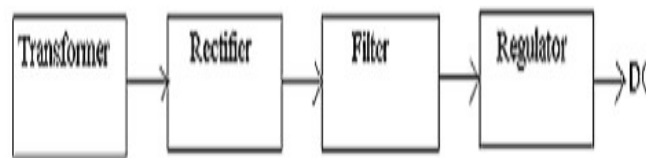


Figure 2: General Block of Power Supply Unit

#### 3.2 Transformer

The transformer works on the principle of Faradays law of electromagnetic induction and mutual induction. As per the law, the change in magnetic flux induces an emf in the secondary coil that is linked to the primary coil. Here, in our project, we are using step down transformer, in order to step down a 230Volts ac into 12Volts ac.

#### 3.3 Rectifier

It's a device that consists of two or more PN junction diode that converts an alternating current into a direct current . Here we are using the full wave rectification process. Bridge rectifier is the best example for the full way rectification process. A bridge rectifier uses 4 diodes that are connected in a form of Wheatstone bridge. Diode1, Diode2, Diode3, Diode4 and a load resistor are connected in a closed loop to convert AC into DC. During positive half cycle, at one terminal, another terminal becomes negative. Hence two diodes like Diode1 and Diode3 becomes forward bias, rest become reverse bias. Similarly, at negative half cycle, the alternative terminal becomes positive while another terminal becomes negative.

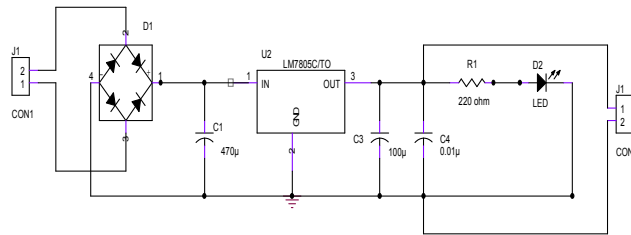
Hence, now the diode which becomes reverse Diode2 and Diode4 become forward bias while Diode1 and Diode3 becomes reverse bias. The output DC signal polarity may be either positive or negative. For our project, it is completely positive.

### 3.4 Filters

Here we are using capacitor is connected to the output of the rectifier and a dc is obtained by attenuating other frequencies across it. The output waveform which is fetched is in the dc voltage which has the negligible ripples. The output we obtained from the low pass filter is a dc voltage of 0 Hz.

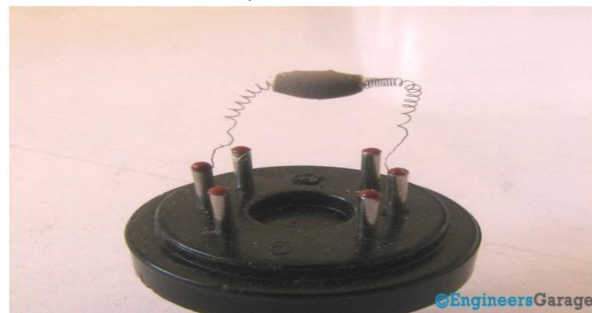
### 3.5 Regulators

The filtered output voltage from the capacitor is gets fetched and finally regulated. The voltage regulator is a device, which maintains the current output voltage constant irrespective to the change in supply, load and temperature variations. Here we use fixed voltage regulator namely LM7805. The IC LM7805 is a +5v regulator which is used in our project.



**Figure 3: Circuit Diagram**

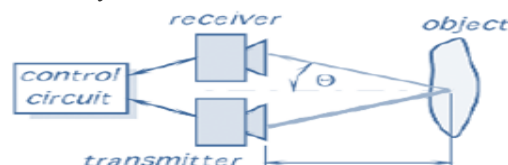
The main intention of the sensor is to attain the desired temperature in order to ionize the gas molecules. First, by the help of the Ni-Cr Wire, the ceramic region present in the gas sensor gets interact. It is considered as the sensing element that is allowed to heating cutting-edge. The warmth receives which is radiated from the ceramic layer gets interacts with gases in the close by vicinity and gets ionized with the other gases. Once, it gets collaborated, these gases are absorbed by the tin dioxide (SnO). Due to the presence of ionize gas in the (SnO) layer makes the variations in resistance takes place. As the resistance changes, the current flowing through the sensing element will also change, as current is inversely proportional to the resistance. The change in resistance makes to convey out lead to the unit.



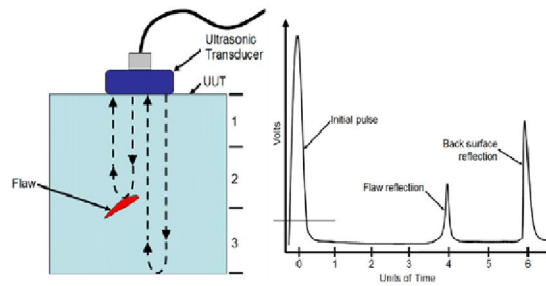
**Figure 4: Gas Sensor**

Secondly, for calculating the fuel level present inside the vehicle, we are going to use Ultrasonic Sensor HC-SR04. It consists of two ultrasonic transducers, one acts as a transmitter and other acts as a receiver. For an ideal range, the pulse will be reflected back within the timeout of 38 milliseconds. We are using two transducers, one known as the trigger and the other known as the echo. In which the trigger transmits and the echo receives.

The trigger sends the 8 pulse pattern, which makes the ultrasonic signature. As for the level, this signal makes a bent or reflects when it falls on the surface of the fuel, thus the bent which it creates is called as a flaw. Once it is reflected back to the echo, the receiver measures the level by means of speed and time. The electrical voltage produced when ultrasonic waves bounce back from the target is called piezoelectricity.



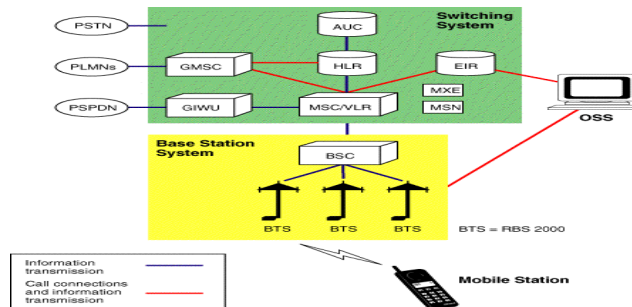
**Figure 5: Working of Ultrasonic Sensor**



**Figure 6:** Flaw detection using Ultrasonic Sensor

Third, In order to find the temperature of the engine of the vehicle, we are using the temperature sensor TMP 36, as it not like sensitive resistor, instead they uses the property of diodes. In case of diode, the temperature changes in the change in voltage with at a known rate. The formula is  $T_{mp} = (V_{out} - 0.5) * 100$ .

After all of the data are amassed, then it's geared up for the transmission. The procedure of transmission taken place by assist of GSM Module. It has SIM chip and Helical Antenna. We are the use of SIM 800A version. This is liable for transmitting the messages and for facts garage. They are well suited with 2G/3G networks respectively.



**Figure 7:** GSM Network Elements

#### IV. LITERATURE REVIEW

The alarming pathetic scenario due to accidents motivated to search for an idea to develop a system which provides solution to all the existing issues and various proposals have been studied to develop the system.

[1] V Padmanaban; M Nalini [2019](Adaptive Fuel Optimal and Cruising Strategy for Vehicle Design and Monitoring Pilot Performance) This reveals that when there is low volume of fuel, the system gets activated. Hence there is a transmission framework as gear mechanical transmission for the change in speed in accordance to the volume of the fuel. Whereas the speed is converted into voltage. As a contribution to the Arduino controller, the voltage fills in.

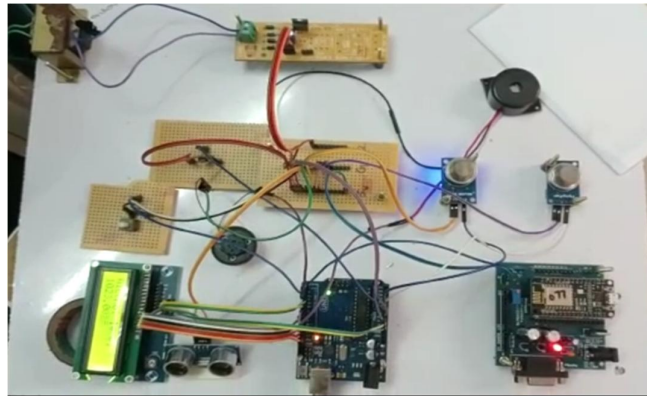
[2]Alexandru Drosu George Suci Andrei Scheianu Ioana Petre[2020](An Analysis of Hybrid/Electric Vehicle Monitoring Systems and Parameters) Hybrid vehicles are gaining popularity than the fuel consumption vehicle because they are friendly to environment, low taxes and concessions in prices of the cars. However it has certain limitations too. It may be rural or congested metropolitan areas which may affect the vehicle performance, reliability and the battery life due to the inadequate power supply.

[3]R Sasvanth Narayan; V Loganathan; Prateek Lakkar Sugant[2021](IoT Cloud based Optimization Of Vehicle Using Monitoring Systems) Recent years, vehicle monitoring systems helped riders in gathering real-time information about their vehicles.

#### V. RESULTS AND DISCUSSION

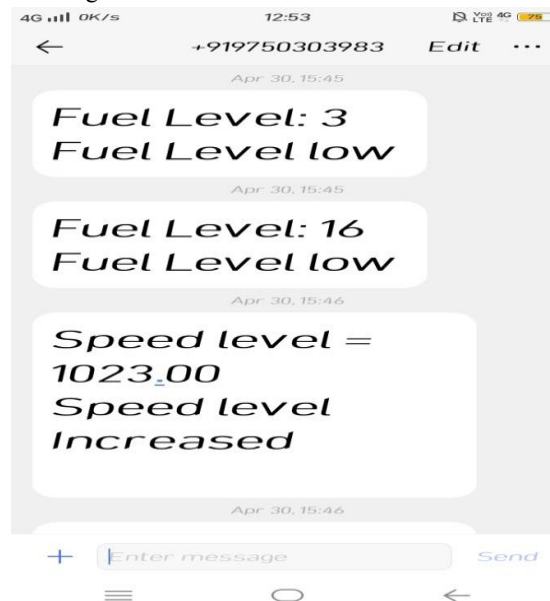
By using Arduino IDE software, all the sensor values are calculated and are been transmitted to the GSM module.

Here is the complete image of the total Vehicle Monitoring System using Arduino UNO. In which each sensors and GSM module is connected with Arduino.



**Figure 8:** Project Kit

By this we are using SIM 800A type of GSM module in which it is a GSM/GPRS only modern module. It can use either a 2G/3G USIM (which provide compatibility for both 2G and 3G). Here are some of images of SMS received from the GSM module at a period of regular interval of time.



**Figure 9:** SMS Received from GSM Module

In case if any value crossing beyond its limit, ex: if the rpm of the vehicle crosses beyond its limit or the level of the fuel getting lower than its threshold value. Then also the warning message will be sent to the owner as well as the driver who is driving the car.

Also the LCD screen present inside the car will also show the monitoring value on it in order to show the customer or the persons sitting inside the car, about the conditions of the car at present situation. Also those messages are been gathered as a file with the aid of the proprietor of the car approximately its maintenance and its circumstance.

## VI. CONCLUSION

By using this Vehicle Monitoring System, the various parameters and its condition of the car is been known to driver as well as the owner who is present in any location. As these monitoring system is well used for the Taxi as well as Travel agency in which multiple information about individual cars given to individual drivers are been known by the owner or controller of the agency. We are using Arduino module and its programming as a result it's very smooth for the proprietor to adjust the program for which the change wanted for the automobile about at any time because of its simplicity. Hence this device can be carried out at a charge of low fee process.

**ACKNOWLEDGMENT**

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