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# “POTHOLE DETECTION AND WARNING SYSTEM USING WIRELESS SENSOR NETWORK”

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### Abstract

In each and every developing country one of the major problems are maintaining the surface of the road. Detecting and reporting the surface condition of the road which assists the drivers to avoid the accidents. We are developing a system for monitoring the surface condition of the road. This system used the ultrasonic sensor for detecting the potholes and which measure the height and depth of the potholes. GPS which is used for plotting the location of potholes. For different types of road surfaces, the control of speed is required to adjust in a proper manner. This paper gives a very cost effective and efficient way of designing a surface identifier for fully autonomous vehicles. In existing system potholes are just identified and the information is tweeted to the driver using beep alarm. The proposed system pothole areas informed to the Government authorities for reconstruction purpose, and also the vehicle speed is contlled. And it also informs the driver in the form of voice, whenever the pits and obstacles are detected using voice module.

**Index Terms:** Ultrasonic Sensor, GSM SIM900, NEO-6M (GPS Module), 16\*2LCD Module.

## 1. INTRODUCTION

*Death ratios of the peoples are increase day to day life.* Road accidents are one of the causes of increasing death ratio. Now a days road accidents are major issue in most of the countries, one of the reason of road accident is due to irregularities of the road surface and high speed of driving. The abnormal road surface condition is mainly occurring due to weather condition, heavy vehicle, those are makes

potholes and all other problems in road. To overcome this problem, regularly monitoring the road surface and control the vehicle speed is necessary. In our method, ultrasonic sensors are used to detect the potholes. The information about the potholes from the sensor is given to the At mega 238 microcontroller. It is helpful to avoid the accidents, vehicle damages, etc. And also the information is send to the

government authority through the GSM module for reconstruction work.

**1.1 Ultrasonic Sensor :**

Ultrasonic sensor is working principle based on RADAR principle. From the fig.1, this sensor has four pins Vcc, Trigger, Echo, Gnd. The Ground and VCC pins are connected to the ground and 5V.

Trigger is used for triggers the sensor. The ultrasonic sensor is transmitting the ultrasound wave if any obstacles are present in the way, it reflect the wave back to the sensor. The reflected wave is received by Echo pin. The Echo pin is gives the time taking for sound wave from transmitting to reflect in sensor. From which we calculate the distance.

**1.2 GPS Module**

The **Global Positioning System (GPS)** is used for finding the location of the potholes. The GPS is already store the area of the potholes and humps on road in database. If any vehicle detects the potholes and/or abnormal road condition, now the GPS is capture the current position of the vehicle and access the stored location to calculate the distance between vehicle and potholes, this information given to controller, the location of the potholes and abnormal road condition is send to the government through the GSM.

**1.3 GSM SIM900:**

This is Quad-band GMS/GPRS modem, it mainly used for communication purpose. It is suitable for SMS, voice as well as data transfer application in M2M interface the modem has RS232 interface, which allows connecting microcontroller with modem. In our system, GSM used for deliver the message about the road condition to the

Government authorities. The government **authority's number is registered in GSM. When**

the any decision from the controller is received, the GSM send the message to the government, this message includes the location of the potholes for reconstruction purpose.

**2. HARDWARE DESCRIPTION**

**2.1 Ultrasonic sensor:**

Ultrasonic sensor provide an easy methods of distance measurement. Provide precise, non-contact distance measurement within 2cm to 3cm range.



**Fig.(a) Ultrasonic Sensor**

**2.2 GPS MODULE:**

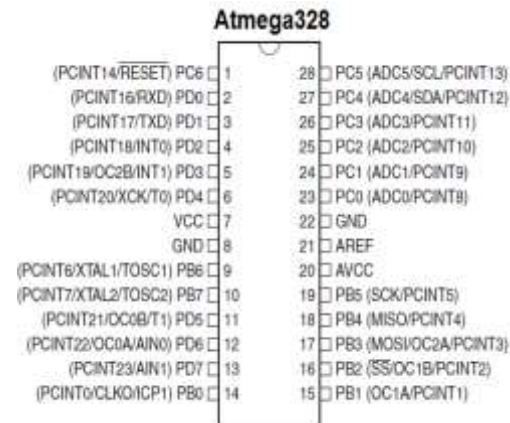
GPS stands for global positioning system by which anyone can always obtain the position information anywhere in the world. GPS is a satellite based system that uses satellites and ground station to measure and compute its position on earth.



**Fig. (b) GPS module**

**2.3 ATMEGA328 MICROCONTROLLER:**

Introduction to ATmega328. ATmega328 is an 8-bit and 28 pins AVR Microcontroller, manufactured by Microchip, follows RISC Architecture and has a flash type program memory of 32KB. It has an EEPROM memory of 1KB and its SRAM memory is of 2KB. It has 8 Pin for ADC operations, which all combines to form Port A (PA0-PA7)



**Fig.(c) pin diagram of Atmega328**

**2.4 GSM Module (SIM900):**

GSM is an open and digital cellular technology used for and transmitting mobile voice and data services operates at the 900mhzA frequency bands. GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose.



Fig.(d) GSM Module

**2.4 16x2 LCD Module:**

An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16x2 LCD means it can display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5x7 pixel matrix.



Fig.(e) 16x2 LCD Module

**3. BLOCK DIAGRAM:**

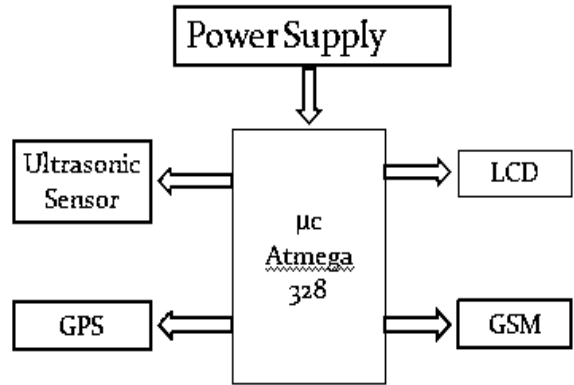


Fig. Block diagram of sensing circuit

**Working:**

The block diagram of the system is shown in fig. Ultrasonic sensor emits an ultrasound at 40,000 Hz which travels through the air and if there is an object or obstacle on its path it will reflect back to the sensor, from the travel time and the measured distance is given to controller. Inside the controller the threshold value is predefined if the measured value is greater than threshold value, it is potholes, if smaller then it is hump otherwise normal road. By this distance, pits on the road can be detected. The controller is preprogramming to control the speed of the vehicle when the potholes are detected. So, when the obstacle behind or front of the vehicle is detected, this information given to the controller. The LCD display the location of the potholes and distance .When the lot of pits are detected, GSM will send the message to government authorities for reconstruction road and that message contain the location of that particular road using GPS.

**4. Advantage: & Application**

The main advantage of this device is, it is low cost equipment and can help maintenance authorities in order to reduce man power in reporting quality of roads. This is a low cost solution for the road safety purpose. This will help to avoid accidents and it can use to identify problem areas early. The system to assist navigation on roads. The pothole detection application proposed in this paper enables the driver to receive information of the potholes on the roads in the vicinity of the moving vehicle.

**5. Result:**

The working model of the system is simulated in proteus simulation software .The simulated output shown in ATMEGA328 microcontroller is used here which control the overall function. Damaged road are inform to driver and government.

## **6. CONCLUSION:**

In this proposed method implemented pothole detection on the road surfaces and reducing the Accidente. Ultrasonic sensors are used to measure the distance from the vehicle and defected road surface. It is helpful to the drivers to avoid accidents. When the potholes are identified in the road surface, immediately in the information is forward to drivers and government authority through GSM for reconstruct the process. In future, previously detect the potholes in the road surface and it is stored in the database. It will be highly useful to the drivers to avoid accidents.

## **7. FUTURE SCOPE:**

The future work may likewise incorporate the location of different anomalies like Expansion joints, Manhole and pipeline gaps. In future the specialists can likewise examine techniques to assess the occasion seriousness at any vehicle driving rate.

## **8. Reference:**

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