

## AUTOMATIC DETECTION OF HUMPS AND DUMPS ON THE ROAD

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**Abstract**-One of the major problems in developing countries is maintenance on roads. Identification of pavement distress such as potholes and humps not only helps drivers to avoid accidents or vehicles damages, but also helps to maintain roads .This paper discuss pothole detection , alcohol detection and also detect vehicles coming behind .This paper proposes a cost effective solution to identify the potholes and humps on the road .Ultrasonic sensor are used to identify the pothole and humps and vehicles coming behind .It will alert the driver by voice message.

### INDEX TERM:

Ultrasonic sensor, Alcohol sensor, 3PIC16F877A, Speaker, Robot model.

### INTRODUCTION:

Over last two decades, there has been a tremendous increase in vehicles population .This proliferation of vehicles has led to problem such as traffic congestion and increase in the number of road accident. Researcher is working in the area of traffic congestion control. Potholes formed due to heavy rain and movement of heavy vehicle, also become a major reason for traumatic accidents and loss of human lives.



Figure 1: potholes on the road

According to the survey report “Road Accidents in India, 2011”, by the ministry of road transport and highways, a total of 1,42,485 people had lost their lives due to fatal road accidents. Of these, nearly 1.5 per cent or nearly 2,200 fatalities were due to poor condition of roads. To address the above mentioned problems, a cost effective solution is needed that collects the information about the severity of potholes and humps and also helps drivers to drive safely.

With the proposed system an attempt has been made to endorse drivers to ward off the accidents caused due to potholes and raised humps. Roads in India normally have speed breakers so that the vehicle’s speed can be controlled to avoid accidents. However, these speed breakers are unevenly distributed with uneven and unscientific heights.

The further section deals with components used in the proposed system, architecture and implementation of proposed system .Last sections tells about experimental result and conclusion

## RELATED WORK

Moreet al.[1], proposed a system where sensors are mounted on public vehicles. These sensors record vertical and horizontal accelerations experienced by vehicles on their route .The installed GPS device logs its corresponding coordinates to locate potholes and the collected data is processed to locate potholes along the path traversed earlier by the vehicle. A Fire Bird V robot is used for experimenting with constant speed. The moving robot is mounted with a servo motor which rotates 0-180 degrees along with IR Sharp sensors. IR Sharp sensors check for variance in constant speed. If variance is detected, it is an indication of a pothole; robot stops and camera moves to take pictures of the pothole while GPS device locates its coordinates. Although this is a cost effective solution, it is restricted to collecting information about potholes. Orhan and Eren[2] had proposed a work developed on android platform to detect road hazards. There are three components in this proposed work viz, Sensing component, Analysis component and Sharing component. The sensing component basically works by collecting raw data from accelerometer and synchronizes with interface, hence leading to ease of access. In analysis component, the values obtained from the sensors are used for developing analysis modules. The sharing component works as follows: the developed framework is connected with the central application, where it can directly communicate with the social network. All the collected data is stored at central repository for further processing. Although this method communicates traffic events with other drivers, it increases the cost and complexity of implementation. Medniset al.[3] have proposed a real time pothole detection model using Android smart phones with accelerometers .Modern smart phones with android OS, have inbuilt accelerometers, which sense the movement and vibrations .The accelerometer data is used to detect potholes. Different algorithms such as thresh, which measures the acceleration amplitude at Z-axis, Z-diff to measure the difference between the two amplitude values, STDEV (Z) to find the standard deviation of vertical axis acceleration and G-Zero are used to identify potholes. Zhanget alChenet al. [4] proposed a system for detecting potholes using GPS sensor and three-axis accelerometer. The outputs are taken from the GPS sensor and three-axis accelerometer and fed into data cleaning algorithm. In the second part of the implementation the inputs to the algorithm are processed for power spectra density (PSD) to calculate the roughness of potholes. After analyzing, roughness is classified into different levels.

## COMPONENTS USED IN PROPOSED SYSTEM

The proposed system offers a cost effective solution for detecting potholes and humps on road. Components used in the proposed work are as follows:

### PIC 16F877A MICROCONTROLLER

It is a 40 pin microcontroller with 8k program memory .It is widely used due to its low cost, high application support and wide availability. Microcontroller is the heart of proposed system. It is responsible to do various tasks.

### ULTRASONIC SENSOR

Sensor used here is SRF04. It is ultrasonic range finder .It is possible to know the exact position of the obstacles in the sonar field of view. It ranges from 3cm to 3m. Resolution ranges from 3 - 4 cm.



Figure 2: Ultrasonic Sensor

### ALCOHOL SENSOR

Ideal sensor for use to detect the presence of an Alcohol.MR-513 type of alcohol sensor is used. Sensitive is high and large output. Fast Response Time less than 10s. Heating Voltage about 5.0V .Dimensions of sensor is 18mm Diameter, 17mm High excluding pins, Pins - 6mm High.



Figure 3: Alcohol Sensor

### VOICE IC

The APR9600 device offer true single chip voice IC recording non volatile storage playback capability 40-60 second .The device support both random and sequential access for multiple messages .Integrated output amplifier microphone amplifier AGC circuits greatly simplify circuit design.

## RELAY

Relay is an electrically operated switch .current flowing through the coil generally create magnetic field which attracts a lever and changes the switch contact .The coil current can be ON or OFF so relays have two switch positions and they are double throw switches. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts.

## LCD

Liquid crystal displays have materials which combine the properties of both liquids and crystals .An LCD consists of two glass panels with the Liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which defines the character ,symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal which makes the Liquid crystal molecules to maintain a defined orientation angle .

## KEYPAD

A numeric keypad for short, is the small, palm-sized, seventeen key section of a computer keyboard, usually on the very far right. The numeric keypad features digits 0 to 9, addition (+), subtraction (-). A numeric keypad for short is the small palm-sized, seventeen key section of a computer (-) multiplication (\*) and division (/) symbols a decimal point (.) and Num Lock and Enter keys. Laptop keyboards often do not have a numeric keypad, but may provide numeric keypad input by holding a modifier key (typically labelled "Fn") and operating keys on the standard keyboard.

## POWER SUPPLY

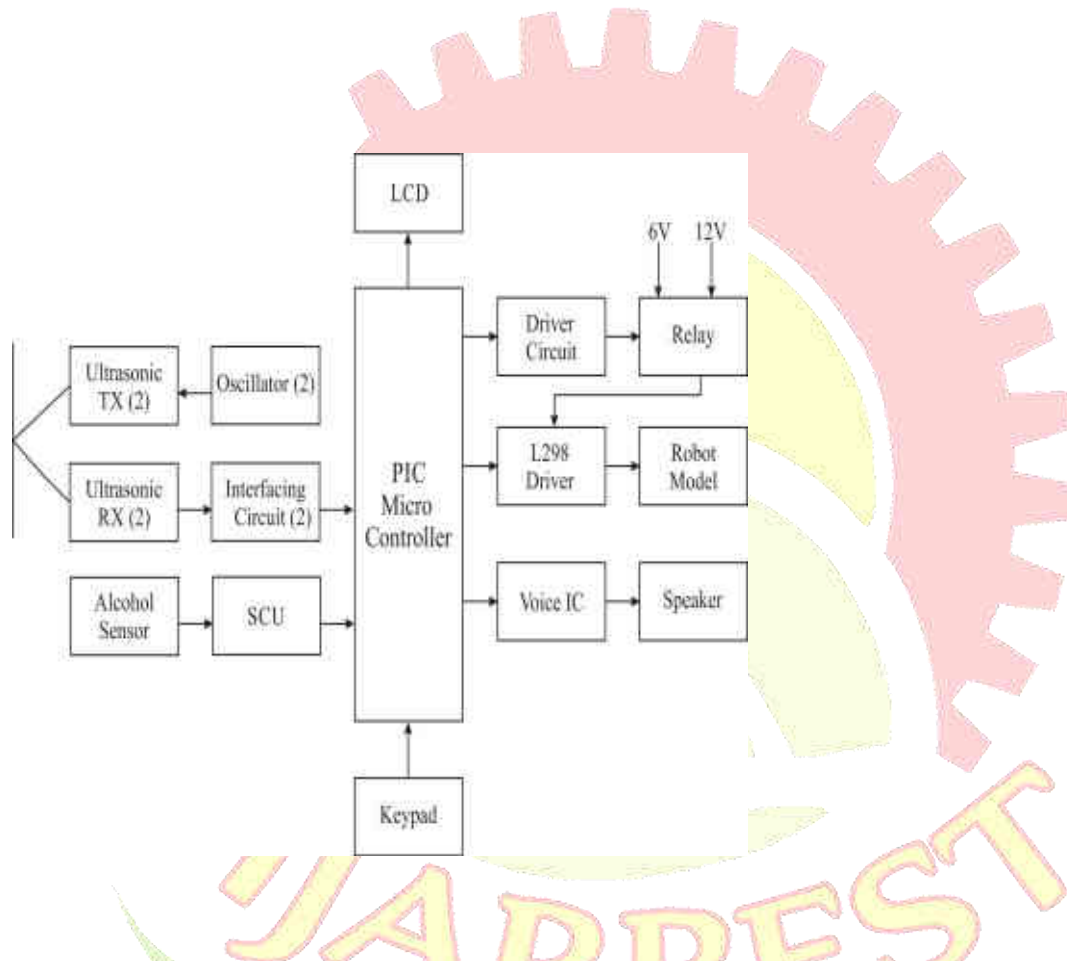
The ac voltage typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

## IMPLEMENTATION

Architecture of the proposed system is given below .It consist of two ultrasonic sensors used to detect the humps and dumps on the road. Oscillating frequency is given to sensors. It is interfaced to the microcontroller. If the sensor detect the potholes .Ultrasonic sensors are used to measure the distance between the car body and the road surface and this data is received by the microcontroller. The distance between car body and the ground, on a smooth road surface, is the threshold distance.The ultrasonic sensor is also used to detect the vehicles coming behind. Now

the sensor will detect the vehicles up to 15meters and alert the driver in a voice message and intimate the driver.

### BLOCK DIAGRAM



In addition to this Alcohol detection is also implemented with this proposed system .When the driver is drunken the alcohol sensor will detect the alcohol smell. When the driver attempts to start the vehicle, the alcohol sensor will sense the human breathing .the output of the sensor will be given to the microcontroller. Then the controller output is given to the driver circuit .It does not allow the vehicle to start.

### EXPERIMENTAL RESULTS

The humps and dumps were detected by using vehicle model. It was tested in a simulated environment with artificial potholes and humps .The microcontroller module fixed on the vehicle module. During the test it was found that the microcontroller module worked as expected to identify potholes and humps and also vehicle behind .The experiment was done successfully.

## CONCLUSION

The model proposed in this paper serves four important purposes; automatic detection of humps and dumps, vehicle behind, alcohol detection and alerting vehicle drivers to evade potential accidents. The proposed approach is an economic solution for detection of dreadful potholes and uneven humps, as it uses low cost ultrasonic sensors. The voice message used in this system is an additional advantage as it provides timely alerts about potholes and humps. The solution also works in rainy season when potholes are filled with muddy water. We feel that the solution provided in this paper can save many lives and ailing patients who suffer from tragic accidents.

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