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Pothole and object detection with respect to the speed of a vehicle using sensors in Arduino UNO board

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ABSTRACT

Pothole detection is important while driving a car to reduce the number of accidents. This will also in turn prevent the vehicle from severe damage in terms of tire. In a densely populated country like India, it is also important to track whether any human being or any object is coming across a vehicle in high road and notifying its driver to reduce the speed and prevent road accidents. In order to detect the pothole and to track any human being or an object, the primary necessity is to have GPS for obtaining the location of the vehicle. This paper aims at proposing a pothole detection and object indicator system in a vehicle which will indicate the presence of potholes or any other object within a range of 20m.

Keywords— Potholes, Accidents, Ultrasonic sensors, Buzzer, GPS

1. OBJECTIVE

The objective of this project is to minimize road accidents due to potholes in the streets through our proposed idea and focus on health and safety of the drivers as well as passengers of the vehicles.

2. INTRODUCTION

India is a densely populated country. Roads are of poor quality and are not maintained properly, due to which portions of the streets get cracked down, worn apart, creating holes which are known as potholes. These holes further expand in due course of time due to continuous negligence, overlooking of the issues and obviously lack of proper maintenance, causing traffic congestions, accidents, wastage of fuel and several other problems. These accidents may be severe enough to cause fatal damage to the affected. Further, too much traffic congestion causes wastage of fuel which in turn, pollutes the air and can cause serious other health problems which can prove to be fatal in the long run. Also, the paper aims at proposing a unique object indicator system which will indicate whether any foreign body has suddenly appeared within a vicinity of 20m or not and the driver can act accordingly, to prevent accident.

2.1 Pictorial representation of potholes in India



Fig. 1: Pothole crisis all over India

According to statistics provided by the Ministry of road transport and highways, potholes have taken 14,936 lives from 2013 to 2017, which is a massive number. To follow with it, almost 30% deaths in our country are caused due to potholes, each year. Given below, is a graphical representation of total number of road accidents due to potholes and case fatalities from 2015-2017.

2.2 Graphical representation of road accidents due to potholes from 2015-2017

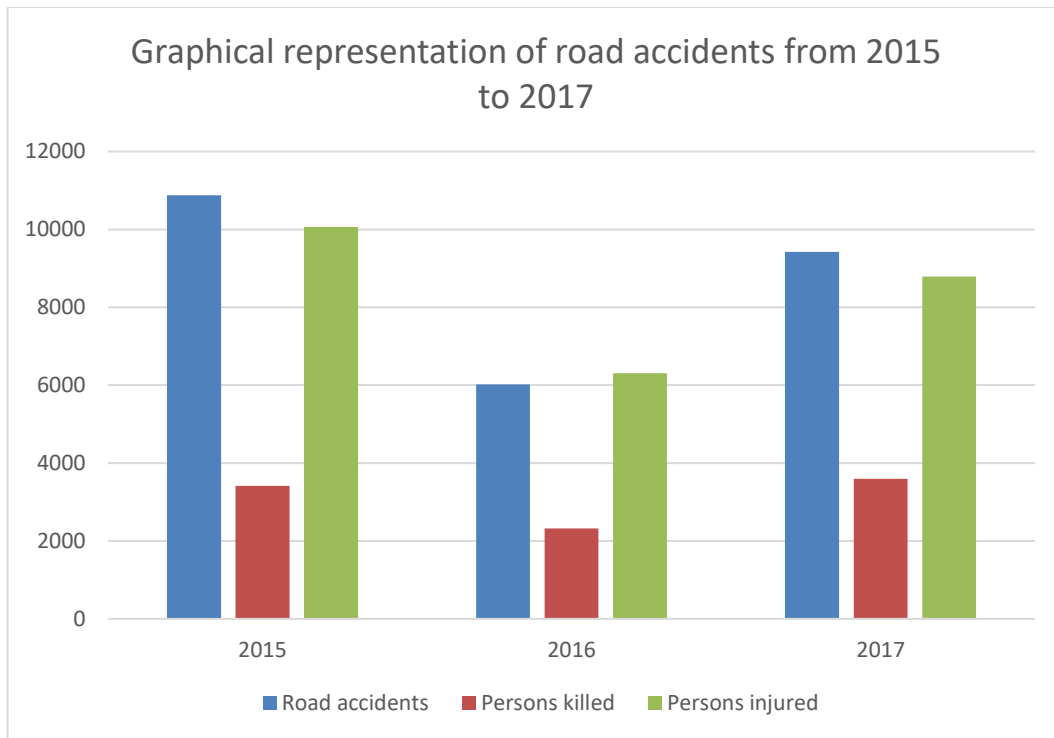


Fig. 2: Statistics of pothole accidents from 2015-2017

3. PROPOSED MODEL

Potholes are indeed a very serious issue. To overcome with it, we have proposed a model that can prevent thousands of accidents all over the country, if implemented properly.

3.1 Block Diagram of the proposed system

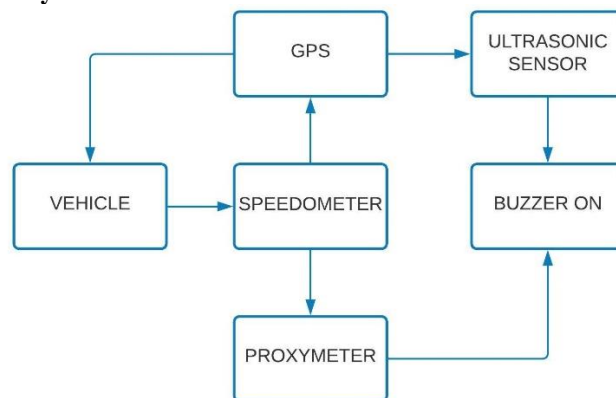


Fig. 3: Block Diagram

3.2 Materials required

- Ultrasonic distance sensor
- Proxy meter
- Speedometer
- Arduino Uno board
- Connecting wires
- LCD display

3.2.1 Ultrasonic proximity sensor: Ultrasonic proximity sensor is an electronic device which converts sound wave into an electrical signal. It is used to measure the distance between its position and the targeted object by emitting ultrasonic sound wave. For doing the same, it calculates the time taken by the ultrasonic wave to travel from sensor to the targeted object. It can be represented by the formula-

$$D = (1/2) * T * C$$

Where, D= Distance travelled by ultrasonic wave

T= Time taken by the ultrasonic wave to reach the targeted object

C= Speed of light



Fig 4: Ultrasonic sensor

3.2.2 Arduino Uno Board: The Arduino UNO Board is an open source microcontroller board based on the microchip Atmega328P microcontroller. The board consists of 14 digital input/output pins, 6 Analog input/output pins, a USB connection, a power jack, an ICSP header and a reset button. It can be programmed with Arduino IDE using a USB cable. It just needs to get connected to a computer with a USB cable or power it with an AC to DC adapter or battery to get started with it.

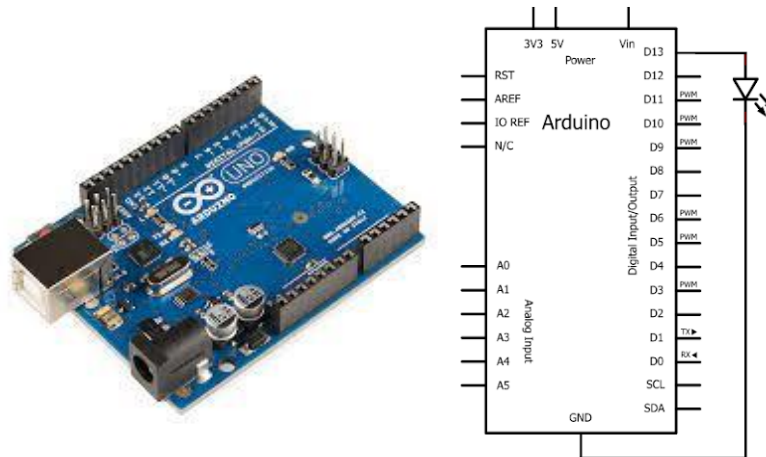


Fig. 5: Arduino UNO Board

3.3 Flowchart of the proposed system

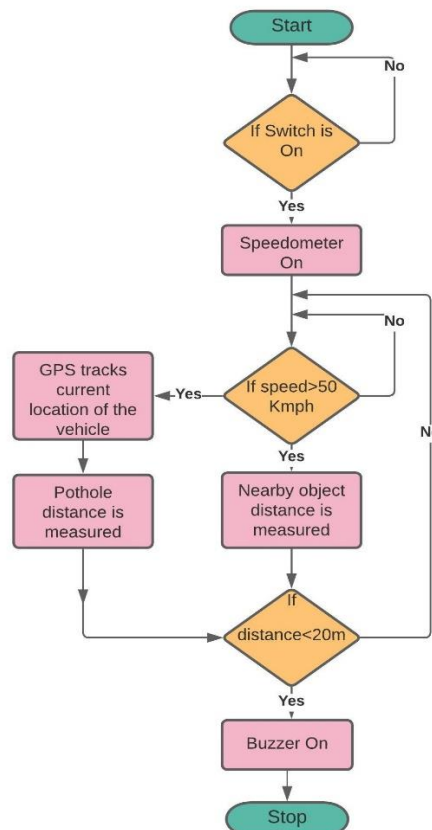


Fig. 6: Flowchart

4. WORKING PRINCIPLE

In our proposed system, we need a GPS and a speedometer inside a vehicle. While driving, if the speedometer is kept ON then the speed will get displayed on the LCD screen continuously. When the speed is greater than 50 km/h, the location of the vehicle is

traced using GPS automatically. After that, the ultrasonic distance measures whether any pothole is present within a range of 20m and at the same time, the proxy meter checks whether an object is present within a vicinity of 20m or not. If one or both the condition is satisfied at any point of time while driving, the buzzer automatically glows with a beep sound, notifying the driver to reduce the speed and have a look at the surroundings. Also, this entire system is connected with a switch which can be manually turned on or off. The system works only when the switch is turned on. This system can be used in vehicles to decrease number of people getting injured or deaths due to unexpected road accidents by a huge margin.

5. APPLICATIONS

This project serves several applications:

- The circuit is simple to understand and easy to implement.
- The model is extremely budget friendly, hence can have a wider reach among people.
- The idea, if implemented properly, can save thousands of lives every year.
- Potholes cause huge traffic congestion in the streets, resulting in fuel wastage. Our proposed idea can save a lot of fuel by avoiding traffic jams here and there.

6. CONCLUSION

The purpose of this research work was to search and find effective ways for dealing with pothole accidents and prevent them further. Now, with our researched work and the model we proposed, we have finally succeeded in building a circuit which when installed within a vehicle, it not only indicates the driver about any nearby pothole, but also indicates whether any other object has come within the vicinity of the vehicle. The buzzer alarms the driver at the correct time and hence, most of the accidents can be prevented by this method. Future exploration on this model can further be implemented to improve the system on a larger scale.

7. REFERENCES

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