

# Intricate Study on Pothole Detection Technology for Two Wheelers using IoT

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**Abstract** - One of the increasing issues of roads people are confronting is intensified road conditions. Due to various reasons like rains, oil slicks, road incidents or unavoidable loss and damage make the roads hard to drive upon. This paper presents a pothole detection system in two wheeler automobiles by sending a notification in the form of warnings using the concepts of IoT (Internet of Things). The objective is to ensure the safety of the two wheeler commuters. This system collects the information of the potholes and humps detected on the road, stores it in the database and also alerts the commuter with a warning message.

**Keywords** - IoT, Pothole Detection, Sensors, Two wheeler commuter, Arduino

## I. INTRODUCTION

Potholes killed 3,597 across India in 2017 - Times of India, July 20, 2018. Potholes have been causing chaos for commuters. The reason being narrow roads in India, poor surface quality and road not being maintained to the mark [1]. Potholes can be caused due to internal factors like pavement erosion by water seeping under it, due to change in climate like heavy rainfall, or external factors such as poor construction management and heavy traffic. The identification and fixing of the potholes may reduce the fuel consumption, wear-tear, and maintenance cost of vehicles. It also helps drivers to avoid accidents or vehicle damages. This paper explains the proposed system in IoT technology for detecting potholes and humps on roads, hardware and software components used in the system, block diagram, flowchart, conclusion and future work.

## II. THE PROPOSED SYSTEM

The pothole detection system consists of 3 module system[3]. Firstly, the detecting module which helps in detecting the potholes /humps encountered by it using ultrasonic sensors and when there is a pothole the values of accelerometer are considered. If the values exceed the threshold value then a pothole is detected. Second, the communication module which helps in exchanging data between WiFi node and vehicle. The Arduino Board is used as a communicating interface between the GPS and the accelerometer and a server which is used to receive the data and send it to the server for storage. The GPS receiver provides the latitude and longitude coordinates. The GPS

location along with google maps link should be sent through GSM module to the database. Third, representation module which analyzes the data received from WiFi node and warns the driver regarding the occurrence of potholes by displaying POTHOLE AHEAD on the LCD monitor as shown in fig 1.



Figure 1: Pothole Detection

## III. COMPONENTS USED

The proposed system offers a cost effective solution to detect potholes and humps on roads and notifying drivers about their presence. Hardware and Software components used in the proposed system are as follows[4]:

- **Embedded system** - It consists of the ultrasonic sensor used to sense the potholes on roads. It is a kind of active sensor which comprises of transmitter and receiver. It also helps in measuring the depth of potholes.
- **GPS Receiver** - Global Positioning System(GPS) is a satellite navigation system which is utilized to record the geographic location and time, despite the weather conditions.
- **Accelerometer** - An Accelerometer measures linear acceleration and captures information about the two wheeler. It is in the form of x-axis, y-axis and z-axis.
- **Arduino Board** - Arduino consists of both a physical and programmable circuit board (microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board [8].
- **LCD Display** - I2C\_LCD is an easy-to-use display module, It can make display easier. Arduino libraries are built for I2C LCD. with the help of only a couple of lines of code the user can achieve text display features [9].

- **GSM Module** - GSM is a mobile communication modem; it stands for global system for mobile communication (GSM).
- **Adafruit console** - Adafruit IO is a framework that makes data useful and helps in easy access of data as well as allows simple data connections with little programming required [11].

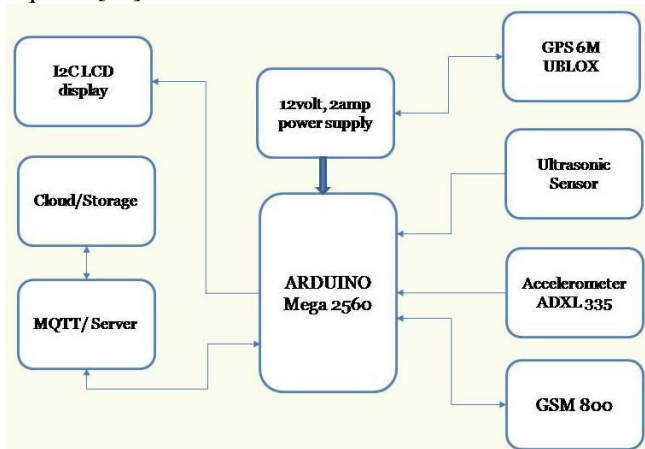


Figure 2: Block diagram

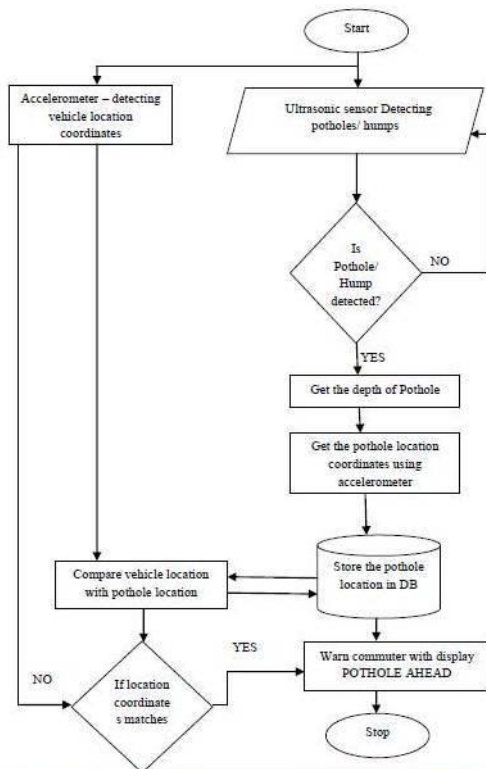


Figure 3: Flowchart of pothole detection [2]

IV. TECHNICAL CHALLENGES

There are various challenges in the system of pothole detection [6]. They are:

- Sensors are sensitive to all weather conditions and also due to wear and tear.

- Discharge rates of batteries are high for continuous data collection. Therefore, batteries need to be charged regularly.
- Potholes may be falsely detected according to the type of shapes of potholes.
- The cut off frequency of the threshold value was found by trial and error. They are highly dependent on the characteristics of the vehicle.
- Depends on the diameter and the condition of the tyres. The effect of pothole on a vehicle with large tyres is considerably less than the effect on a vehicle with small tyres.

V. MARKETING AND VALUE PROPOSITION

The proposed system would provide complete information to Two Wheeler Commuters regarding potholes in different areas based on the data received by the IOT sensors. Damages can be avoided as the commuters will get notifications about potholes nearby from the data stored on the database.

Manufacturers and Dealers provide service and maintenance along with packaging which other manufacturers are not providing currently. Also, exchange and resale value provided at a discounted price to make it profitable for manufacturers. Profit share on each and every unit sold on a fixed percentage basis.

Through online, profit share per unit sold on a fixed percentage basis. Exchange and resale value provided at a discounted price.

VI. CONCLUSION

The proposed model of detecting potholes and humps in two wheelers is economical as it uses low-cost sensors. This will be an important tool to avoid accidents in the place where the risk of accident or injury is substantial.

VII. FUTURE WORK

The pothole detecting system can overcome the challenge of sensor sensitivity due to bad weather conditions by designing the package such that the product sustains and excels in all weather conditions. The data collected can be utilized by the government to improve the road conditions in order to avoid accidents.

VIII. REFERENCES

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