USE OF ULTRASONIC SENSOR FOR DETECTING POTHOLES– AN IoT BASED SYSTEM

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Abstract: One of the major issues of developing countries is the conditions of the roads. Potholes are one of the main reasons behind poor road conditions and has caused a large number of accidents, thereby causing loss of lives. Detection of potholes will therefore benefit people for safer commutation.The previously proposed system had their focus on image processing to detect the potholes, which was not very accurate. In our system, the use of Ultrasonic sensors has minimized the problem of accuracy which was faced previously. The sensor that is mounted on a bot will sense the data that includes the depth, width and height of the potholes along with its GPRS coordinates. It is then collected and stored in a database, which can be used in the future by the Government authorities for road maintenance. Two Android applications have been developed- one for the user and the other for the admin, to control the bot.

IndexTerms: **Ultrasonic sensor, IoT board, Arduino Microcontroller, Wifi-module.**

I. INTRODUCTION

India has difficult road and traffic conditions. Traffic jam, safety issues, rash driving and increasing load of vehicular traffic are decreasing the quality of road. Pothole identification techniques have been produced to give a cost-effective solution to identify the potholes on roads. Ultrasonic sensors are utilized to recognize the potholes and also to measure their depth, width and height respectively, along with the location coordinates. In the proposed framework, we have built a bot with Ultrasonic sensor, Wifi-ESP module, Arduino microcontroller mounted on it. An Android application has been developed for the admin to control the movement of the bot. Similarly, another application has been made which will inform the user about the number of potholes on a particular route.

The following segments of the paper explains the proposed system, related works, system architecture and conclusion.

Fig 1. Indian roads with potholes.

II. PROPOSED SYSTEM

Ultrasonic sensor is used to measure the distance between the bot and the road surface. To detect the potholes, we run the bot on the affected road. The sensor senses the potholes and gathers information about potholes and their geographical locations. This data is then sent to the server.

III.RELATED WORKS

This section gives a brief description about the existing solutions for detecting potholes on roads.

An image processing approach considered stationary images to build the pothole detection system. It compared the current pothole image with the already existing pothole images from the database. Another system proposed a model for analyzing 3D pavement distress images. It used a Kinect sensor, which gave the direct depth measurements. The Kinect sensor consists of a RGB camera and an IR camera, and these cameras captured RGB images and depth images. These images were analyzed using MATLAB environment, but their images were blur.

Thus, our system aims at overcoming the disadvantages of the above systems.

IV.SYSTEM ARCHITECTURE

The following diagram shows the architecture of our proposed idea. The sensor and wi-fi model   are connected to the microcontroller. The sensor detects the potholes and sends the information to the microcontroller. The Wi-fi model is used for internet connectivity. After this, microcontroller processes the received data and computes the height, width and depth of the potholes. This information is stored in the data file. Filtration of the information stored in the data file, is done by the software filter. The filtered data is then applied to the detection algorithm for further calculations.
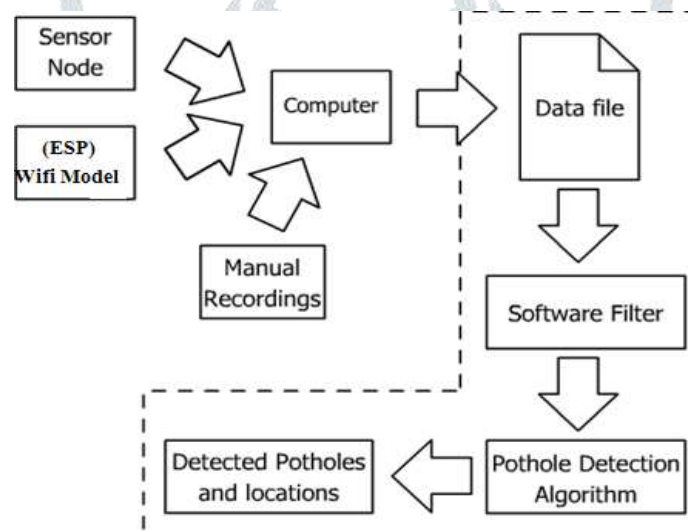
Fig 2. System Architecture

Ultrasonic sensors are used to measure the distance between the bot and the surface of the road. Threshold distance is the distance between bot and the ground, on a smooth road surface; which depends on the ground clearance of vehicles and can be configured. If the distance measured by ultrasonic sensor is greater than the threshold, it is a pothole, otherwise it is a smooth road.
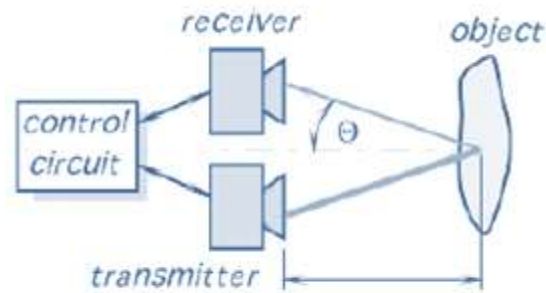
Fig 3. Working of Ultrasonic Sensor

The location coordinates of the detected pothole is captured by the GPRS. The distance between the vehicle location and the pothole location stored in database is computed.

V.CONCLUSION

Thus, in this paper, we have discussed about the working of ultrasonic sensor for detection of potholes. The main reason behind the use of ultrasonic sensor was to overcome the disadvantages caused by the systems using image processing for pothole detection.

VI.REFERENCES

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