

Implementation on Automated Pothole Detection System using Internet of Things

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ABSTRACT

The project is about automated pothole detection system and this enables the user to find out the the number of potholes from source to destination so that user does not meet with an accident. The aim is to collect the data from Ultrasonic Sensors and deliver it to server from where it will be fetched by android application and real time location of a pothole can be viewed on the map which is integrated on to the android application. The user can log on to the application and can know about the number of potholes on a particular path. This app detects the potholes and gives the count to the user, in order to choose a convenient route. For this we have used ultrasonic sensors, ESP- module for controlling the working of the bot.

Keywords: ESP, Bot, Ultrasonic sensor, pothole detection, IoT.

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I. INTRODUCTION

Driving has become one of the damaging experiences in our life. several drivers are losing their lives because of unsafe road conditions. within the current situation, maintenance of roads has become the most difficult factor. Over the last ten to twenty years, there's an enormous increase in population rate moreover as vehicle purchase rate. Nearly 90 % of India's population is implementing roadways to travel daily. So, safety is the major issue for the drivers who drive different vehicles on roads. Driving safely isn't the sole way to avoid accidents as a result of the accident might occur because of varied different reasons like an improper construction of roads, potholes, and humps present on the paved surface, etc. Potholes are largely formed because of serious rains or the run of heavy vehicles on the roads. A Report taken in 2017 in India on Road Accidents, reported by the Transport analysis wing under the Ministry of Highways & Road Transport, has mentioned that several folks died on roads accidents in India in 2017, compared to the quantity of death s in 2016. The info has additionally reported that the states of Uttar Pradesh and Tamil Nadu have the utmost number of deaths. As per the info noted within the report, the country features a record of at least 4,80,652 accidents in 2016, that ends up in nearly 1,50,785

deaths. The quantity tells that a minimum of 413 folks died daily in nearly 1,317 road accidents because of potholes.

II. LITERATURE SURVEY

Paper Name : A research of pavement potholes detection based on three-dimensional projection transformation.

Author Name: H. Youquan, W. Jian, Q. Hanxing, Z. Wei, and X. Jianfang

Year: 2010

Summary: The optical imaging principle of 3-dimensional projection transformation is utilised in a model, to obtain pictorial information of pothole's cross-section in pothole detection. Various digital image processing techniques or methodologies, along with: binarization, image processing, thinning, three dimensional reconstruction, error analysis and compensation are performed in the series of image analysis and processing.

Paper Name: Metrology and visualization of potholes using the microsoft Kinect sensor

Author Name: I. Moazzam, K. Kamal, S. Mathavan, S. Usman, and M. Rahman

Year: 2013

Summary: An author has developed a model in which a low cost Kinect sensor is used. Kinect gives the direct depth measurements, thereby reducing computing costs. Meshes are generated for better visualization of potholes. Area of pothole is analyzed with respect to depth.

Paper Name : Potholes detection based on SVM in the pavement distress image

Author Name: J. Lin and Y. Liu

Year: 2010

Summary: An author has proposed a method for pothole detection based on SVM, where SVM stands for Support Vector Machine. Texture measure based on the Histogram is extracted as the features of the image region, and the non-linear support vector machine is built up to identify whether a target region is a pothole. Based on this, an algorithm for recognizing the potholes of the pavement is proposed. The experimental result shows that the algorithm can achieve a high recognition rate.

III. PROBLEM STATEMENT

In the past few years, there has been a large increase in vehicle population. This increase in vehicle population has led to increasing road accidents and also traffic congestion. According to Global Road Safety OverReport, 2015 released by the World Health Organization (WHO), India accounts for more than 200,000 deaths because of road accidents. These accidents can be due to over speeding, drunk and driving, jumping traffic signals and also due to humps, speed-breakers and potholes. Hence it is important to collect information regarding these poor road conditions and distribute the same to other vehicles that in turn help reduce accidents caused due to potholes and humps. Hence, in this system we have proposed a system that would notify the drivers regarding any hurdles such as potholes and humps and this information can be used by the Government to correct these roads effectively.

IV. PROPOSED SYSTEM

Our planned system consists of an ultrasonic detector. It senses the space between the vehicle and also the pothole. The detector provides the distance values to the PIC microcontroller. Based on the gap, an indication is provided to the server. The indication is provided after all the readings have been taken in and processed using the pothole filtering algorithm .

MODULES

A. User Module

The user will do registration process on the mobile then after the registration they will login to get information about the the number of potholes in the path from the source to the destination location provided by them. Whenever the user will register, the data will get automatically updated into the database of the admin section.

B. Database

This is the database section where all the data related to the users and the locations of potholes is stored. The admin will login using their username and password and can delete,

update and make necessary changes as per the requirements. It also stores detailed information about the potholes like it's depth, width and latitude-longitude values.

C. Admin Module

In the proposed system, the admin will be operating the bot for detection of potholes. Admin will be able to see the specifications of each pothole detected by the bot. Bot will be operated using an Android application. Admin has complete access to the database and can make changes, if necessary.

SYSTEM ARCHITECTURE

The project is about automated pothole detection system and this enables the user to find out the the number of potholes from source to destination so that user does not meet with an accident. The aim is to collect the data from Ultrasonic Sensors and deliver it to server from where it will be fetched by android application and real time location of a pothole can be viewed on the map which is integrated on to the android application. The user can log on to the application and can know about the number of potholes on a particular path. This app detects the potholes and gives the count to the user, in order to choose a convenient route. For this we have used ultrasonic sensors, ESP- module for controlling the working of the bot.

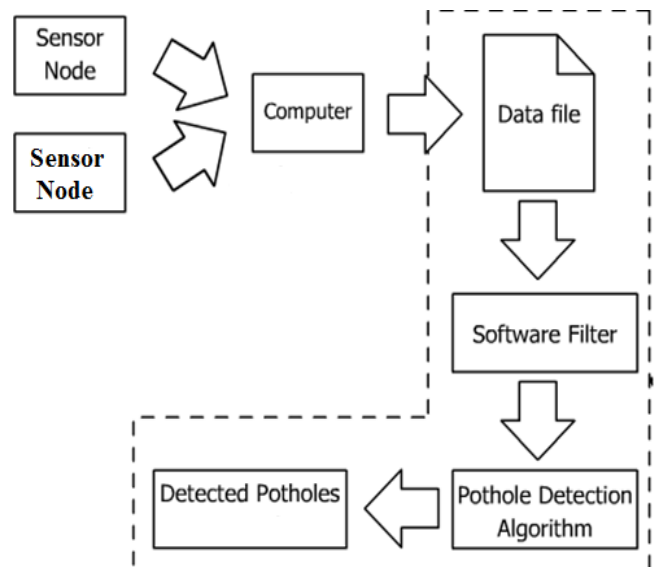


Fig 1. System architecture

V. ALGORITHM

Requirement : Network N , Weight of Pothole Identification Id for all the values in the Database as input, Sensor S , Controller, E is the set of edges(arcs), V is the correspond to interconnecting points.

Step 1: for all pothole id Ed do

Step 2: for all Id in the database do

Step 3: if Pothole with identification number Id is on arc e then // Arc-damage sum, $d1(e) = d0 + b(Id)$ where $b(Id)$ is the

depth of the pothole on arc e with identification Id .

Step 4: if $d1(e) < d0$

Step 5: end if

Step 6: end for
 Step 7: end for
 Step 8: return pothole Weighted to the server $G0 = (V, Ed)$ of Street network.
 Step 9: Stop

VI. HARDWARE AND TECHNOLOGY USED

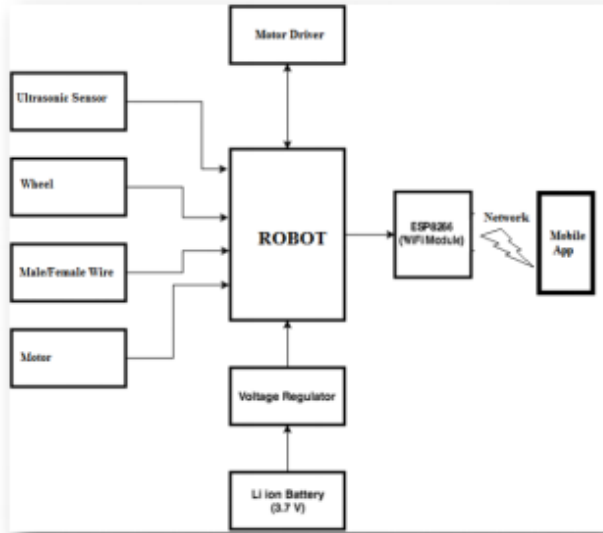


Fig 2. Hardware block diagram

Hardware component:

- ESP8266 (Wi-Fi model)
- Ultrasonic Sensor
- Motor Driver
- Battery
- Bot

Software requirement:

We have created system in Java technology. Data is stored in MySQL database. We have created a mobile application using Android Studio 3.0. For distance measurement in between car body and road surface we use Ultrasonic Sensor (HC-SR04). Mobile application that communicates with vehicle driver using local server. We have calculated depth parameter it shows if there is pothole present or not.

VII.RESULT

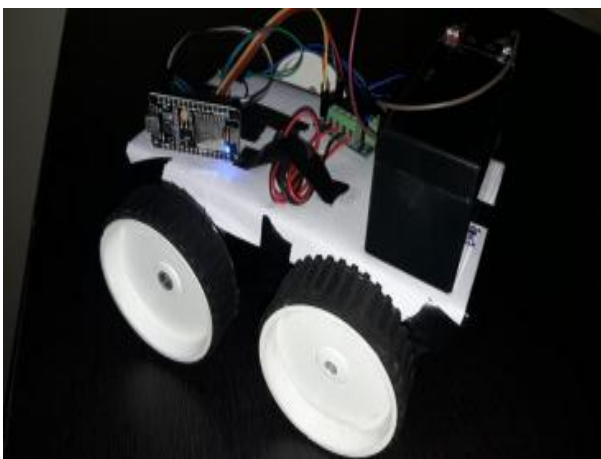


Fig 3. Hardware setup

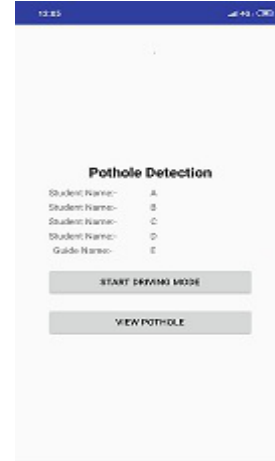


Fig 4. Home page

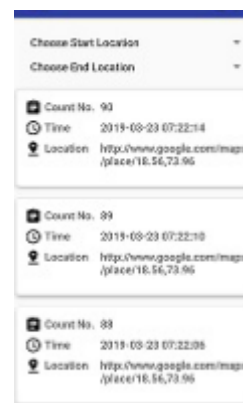


Fig 5. Pothole detection details

VIII. CONCLUSION

The system it automatically detects the potholes sends the information regarding this to the vehicle drivers, so that they can avoid accidents. This system helps us to avoid dreadful pothole hence to avoid any tragic accidents due to bad road conditions. The information can also be used by the Government authorities for the maintenance of the roads.

IX. FUTURE SCOPE

The routing for avoidance can be studied in detail and efficient algorithms can be proposed. Moreover, the system is still a theoretical proposition which can be implemented in metropolitan cities.

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