Path hole Detection System: Using Wireless Sensor Network

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ABSTRACT

Here we propose design of 'Pothole detection System' which assists the driver in Avoiding pot-holes on the roads, by giving him prior warnings. Warnings can be like buzzer if the driver is approaching a path hole, or driver may be warned in advanced regarding what road has how many potholes. This system is divided into three subsystems.
The sensing subsystem which senses the potholes encountered by it, about which it did not have the prior information.
Then communication subsystem which transfers the information between Wi-Fi access point and mobile node.
Access Point broadcasts the data about potholes in its area.

Keywords— Ultra-Sonic Sensor, Bluetooth, Android, Server Database.

ARTICLE INFO

I. INTRODUCTION

We are going to develop a effective road surface monitoring system for automated pathhole detection. This is a low cost solution for the road safety purpose. This will help to avoid accidents and can use to identify problem areas early. The authorities can be alerted to take preventive actions; preventive actions can save money. Poorly maintained roads are a fact of life in most developing countries including our India. A well maintained road network is a must for the well being and the development of any country. So that we are going to create an effective road surface monitoring system. Automated path hole detection is our focus in the system.

This is first ever system for pathhole detection. In this we are using wireless sensor network.

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- This is a low cost solution for the road safety purpose.

- This will help to avoid accidents and can use to identify problem areas early.

II. PROBLEM DEFINITION

Over 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 Report, 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.

To develop a system based on IOT to detect Path holes and the road which will be uploaded on server and notified to all the user using the application and update as per the condition.

III. GOAL AND OBJECTIVE

Goal:

Poorly maintained roads are a fact of life in most developing countries including our India.

A well maintained road network is a must for the wellbeing and the development of any country.

So that we are going to create an effective road surface monitoring system.

Automated path hole detection is our focus in the system.

Objective:

Path hole Detection

Updating on Server

Notification to Users

Updating a per the latest condition of Road

IV. EXPECTED OUTCOME

The system it automatically detects the potholes and humps and sends the information regarding this to the vehicle drivers, so that they can avoid accidents. This is a cost efficient solution for detection of humps and potholes. This system is effective even in rainy season when roads are flooded with rain water as well as in winter during low visibility, as the alerts are sent from the stored information in the server/database. This system helps us to avoid dreadful potholes and humps and 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.

V. LITERATURE SURVEY

Youquan et al. [2] have developed a model which employs optical imaging principle of 3-dimensional projection transformation to obtain pictorial information of pothole's cross-section in pothole detection. Multiple digital image processing technologies, including: binarization, image processing, thinning, three dimensional reconstruction, error analysis and compensation are conducted in the series of image analysis and processing.

Lin and Liu [3] have 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.

Moazzam et al. [4] have 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. The approximate volume of pothole is calculated using trapezoidal rule on areadepth curves through pavement image analysis. In addition pothole's area, length, and width are estimated. The paper also proposes methodology to characterize pothole.

Rode et al. [5] have designed a system in which novel Wi-Fi based architecture for pothole detection and warning system which assists the driver in avoiding pothole on the roads by prior warning. The system consists of access points placed on the road sides for broadcasting data, which can be received by Wi-Fi enable vehicles as they enter the area covered by the influence of the access points. The application can be integrated in the vehicle so as to alarm the driver in the form of a visual signal, audio signal or even trigger the breaking system.

R. Sundar, et al. [6] have developed an intelligent traffic control system to pass emergency vehicles smoothly. Each individual vehicle is equipped with special radio frequency identification (RFID) tag which makes it impossible to remove or destroy. If RFID-tab read belongs to the stolen vehicle, then a message is sent using GSM SIM300 to the police control room. In addition, when an ambulance is approaching the junction, it will communicate to the traffic controller in the junction to turn on the green light.

Samyak Kathane, et al. [7] have proposed a model which is Real time pothole detection and vehicle accident detection and reporting system and Antitheft. In this system the wireless access point collects the information about potholes, it distributes this information to BMC using wireless broadcast. This system is used for the accident detection too. Antitheft in car can help to save million of dollars. Sensor boards that we used for collecting the environmental data also has an accelerometer that can measure both the vertical and the horizontal acceleration. for example, when a bus goes over the pothole there would be significant change in vertical component of the acceleration and for humps there would be a horizontal component.

Taehyeong Kim, et al. [8] proposed a paper in which classification of potholes are given. Potholes are classified according to the location, shape, length and depth. Many researchers have studied the methods to detect potholes and improve survey efficiency and pavement quality through prior investigation and immediate action. With these detecting methods, there is need for developing a classification guideline for supporting decision-making system of pothole repair. The purpose of this study is to develop a guideline of pothole classification for supporting a decision-making system of pothole repair.

Ajit Danti, et al. [9] have developed a model based on Image Processing approach. In this paper Haugh Transformation is given for lane detection. Clustering based algorithm is used for detection of potholes. In this experimental results are tested with real time image database.

Gunjan Chugh, et al. [10] have developed a system in which the various road conditions are detected using smartphone sensor. This system includes a set of sensors installed in vehicles. The most common approach for detecting road condition is using sensors. GPS receiver is used to collect

the data. This solution provides the method for detecting road anomalies like potholes.

VI. PROPOSED SYSTEM

Roads are normally placed with speed breakers that are used to control the speed of the vehicle. But these speed breakers have been a cause of accidents because a definite dimension is not followed throughout. Likewise, potholes are formed due to oil spills, heavy rains and also due to movement of heavy vehicles. These bad road conditions cause accidents, affect the quality of driving and also consumes more fuel. Hence, in this paper 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.
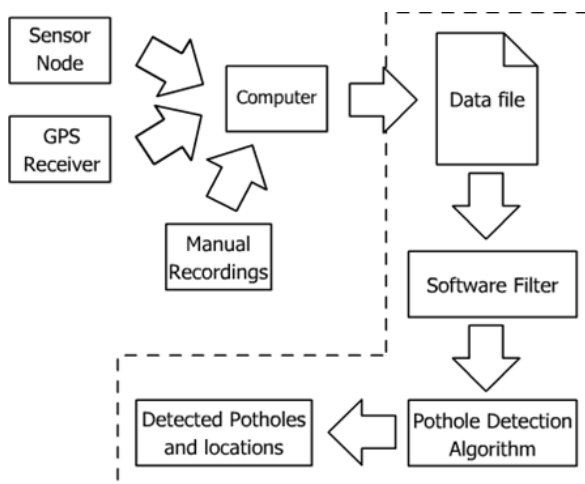
VII. SYSTEM FEATURES

System Features-I
GUI Application:
Three tier web applications consist of presentation logic, business logic and data logic. Presentation logic is where user interface (UI) is developed using which users initiate web requests. Business logic is where the validations and web service functionalities are written. Data logic is related with all the database queries generated as a result of web requests.

System Features-II
Automatic Pathhole Detection:
Roads make up to the majority of means of transportation used as of today in India. Regular maintenance of these roads is important as they are filled with unexpected hurdles such as potholes and humps. These hurdles cause vehicle damage and also have caused a number of accidents in the past that make up to a considerable amount and should be given a thought about. This paper proposes a cost-effective solution that provides timely alerts to the drivers regarding potholes or humps.

System Features-III

Send Server Notification

The proposed system can be divided into three sub-units: the sensing sub-unit, the server sub-unit and the user subunit. At the sensing sub-unit, an ultrasonic sensor is used to detect potholes and humps, whose location co-ordinates are retrieved by the GPS receiver. This data is stored to the database, which is the sever sub-unit. At the user sub-unit a hardware module is set-up that provides timely alerts to the drivers regarding potholes and humps.

Hardware Interface:
- Our system interacts with resource files in web server system

- System interacts with the database server in LAN
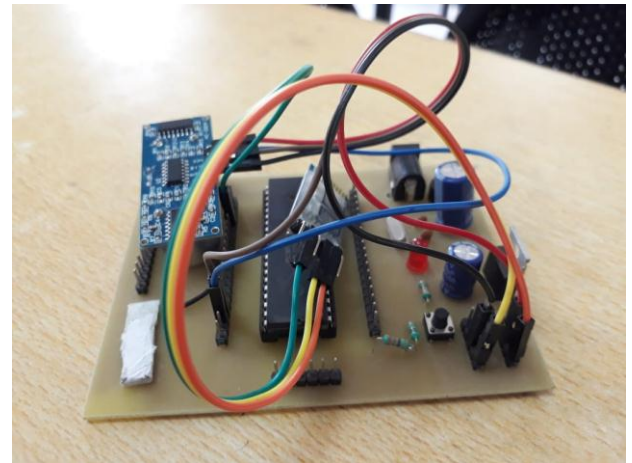
1. Ultrasonic Sensor:-

Ultrasonic transducers or **ultrasonic sensors** are a type of acoustic sensor divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and

In a similar way to radar and sonar, ultrasonic transducers are used in systems which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a signal and receiving an echo the distance of an object can be calculated. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions.

2. Bluetooth:-

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz[3]) from fixed and mobile devices, and building personal area networks (PANs). Invented by Dutch electrical engineer Jaap Haartsen, working for telecom vendor Ericsson in 1994,[4] it was originally conceived as a wireless alternative to RS-232 data cables.
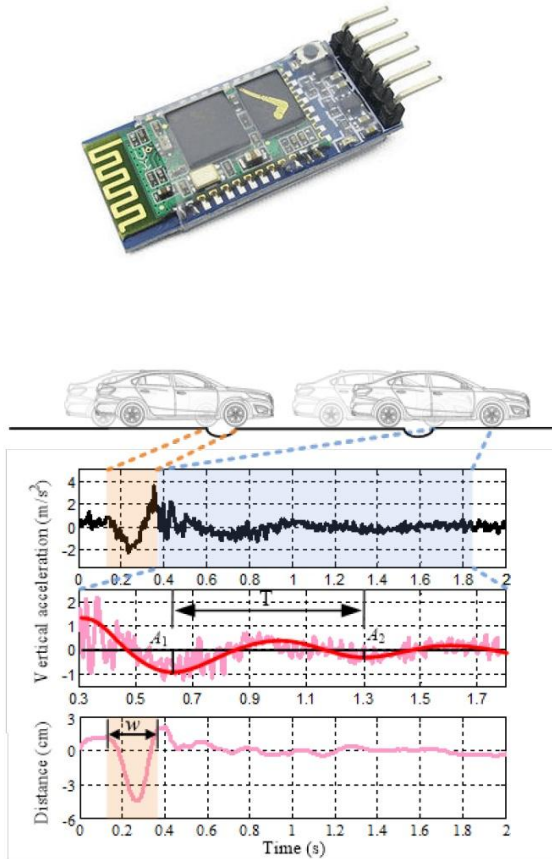

Fig. 3

Illustration of the forcing and underdamping vibrations caused when a car is passing over a pothole

VIII.   APPLICATIONS

1. Using ultra-sonic sensor we can detect pothole and make aware to upcoming cars that there is pothole detected.
2. Security purpose for driver .

IX. CONCLUSION

The system it automatically detects the potholes and humps and sends the information regarding this to the vehicle drivers, so that they can avoid accidents. This is a cost efficient solution for detection of humps and potholes. This system is effective even in rainy season when roads are flooded with rain water as well as in winter during low visibility, as the alerts are sent from the stored information in the server/database. This system helps us to avoid dreadful potholes and humps and 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.

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