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## PERCEIVING POTHOLE PROFILES WITH WARNING SYSTEM USING WIRELESS SENSOR NETWORKS

Nilam Jalindar Mahadik<sup>1</sup>, Prof. Sunil Deokule<sup>2</sup>

Department of Computer Engineering, Shree Ramchandra College of Engineering, Lonikand, Pune, India.<sup>1</sup>

HOD, Department of Computer Engineering, Shree Ramchandra College of Engineering, Lonikand, Pune, India.<sup>2</sup>

mahadik.nilam4@gmail.com<sup>1</sup>

*Abstract: Pothole Detection system is a unique concept and it is very useful to whom which face the problem of pothole in their route. The technology is purely new and idea is generated a profile for pothole in your vehicle journey. It is an application which is allowing to fetch timely and correct road condition information, especially about dangerous potholes in the public and the government transport purpose. In the proposed work, We perceiving pothole profile in the participatory urban vehicle journey. It achieves a an effective road surface monitoring system for automated pothole detection. In addition performance benefit to accessing a timely and accurate road condition information also keeping up with maintenance of our vehicle. It contains the wireless sensor network for pothole detection.*

*Keywords— Potholes and Humps, GPS Receiver, Ultrasonic Sensor, Wireless Sensor Network.*

### I INTRODUCTION

We are going to develop an effective road surface monitoring system for automated path hole 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 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. This is first ever system for path hole detection. In this we are using wireless sensor network. This is first ever system for pothole detection. In this we are using wireless sensor network.

- This is a low cost solution for the road safety purpose.
- We are going to develop a effective road surface monitoring system for automated pothole detection.
- This will help to avoid accidents and can use to identify problem areas early.
- The authorities can be alerted to take preventive actions.

### A. Project Objective:

The main work of the proposed system is providing systems that ensures vehicle to the safe journey in terms of pothole in sensing unit calculate the depth parameter of the road surface so according to the threshold value and depth parameter it shows if there is pothole or not.

In our proposed system we can be installed the application on any transport vehicle. It would inform about the potholes and report those potholes to the passenger device. An application on that phone would then add the pothole locations to a remote database that stores pothole location data for all users of this application. Pothole detection system consist of three units :

### B. Server Unit:

The server unit is nothing but the database for system. It is an transitional layer between sensing and user units. Its function is to store the updated information received by the sensing unit and provide to the requested user unit whenever needed. This unit can also be updated frequently for precise information related to the potholes and humps.

### C. Sensing Unit:

This model consists processor, GPS receiver, ultrasonic sensor (HC-SR04) and GSM SIM 900 modem. The distance in between the car body part and the road surface is

measured with the help of an ultrasonic sensor. A threshold value is set such that the value depends on ground clearance of the car body. The calculated distance is compared with the threshold value to detect pothole or hump. If the measured distance is more when compared with the threshold value, then it is classified to be a pothole, and if the measured distance is low, then it is classified to be a hump. The location co-ordinates fetch by the GPS receiver, along with this data the information regarding the detected pothole or hump at a particular location co-ordinate is broadcast to the server using a GSM modem. The objective of the proposed system is achieved by involving valuable techniques like ultra sensor unit.

**D. User Unit:**

The user unit is responsible for providing notification regarding the potholes on roads at a specific given location. The GPS receiver is constantly receiving update regarding its location co-ordinates, using this information the database is checked for any data nearby the given location co-ordinates. Any data found, it is received by the processor from the database through the GSM modem and the same is displayed in system .

**II LITERATURE SURVEY**

X.Jianfang,Q. Hanxing, Z. Wei,H. Youquan and W. Jian, A research of pavement potholes detection depends on three-dimensional projection transformation, the paper was developed a model where using optical imaging principle of 3-dimensional projection transformation to precisely collect cross-section pictorial information of potholes in pothole detection. It uses the many digital image processing technique like thinning, image processing, dimensional reconstruction, error analysis , compensation and binarization, are collected and coordinated in the series of image analysis and processing[1].

In this paper author [2] proposed a method of pothole system based on Support Vector Machine. It is a texture measure which draw Histogram is extracted as the features of the image region, and the non-linear support vector machine is built up to check whether a focus region is a pothole or not. With the help of algorithm which recognizing the potholes of the pavement is proposed but it has high recognition rate.

S. Mathavan, S. Usman, K. Kamal, M. Rahman andI. Moazzam, Detection of potholes using the Microsoft Kinect sensor, in this paper proposed a model in which a Kinect sensor is used for pothole detection. Kinect sensor collect the direct depth measurements also reducing computing costs in system. Meshes are created for great visualization of potholes on route. Area of pothole is analysis with the help of depth. The approximate volume of pothole is

Carefully calculated using trapezoidal rule on area depth curves through pavement image analysis. In advanced potholes area, length, and width are defined. [3].

P. Goyal,S. Rode, P. Kulkarni,S. S. Vijay, and K. Arya, Pothole warning and detection system: With infrastructure support and system design, In this particular literature have explain a system in which upcoming technology Wi-Fi based architecture for pothole detection and warning system which guide the passenger in ignore the pothole on the roads by prior warning information. The system has many access points which is located on the road sides for broadcasting information, which can be collect by Wi-Fi enable transport vehicles as they enter the area covered by the access points influence. The application is developed a combination in the vehicle so as to alarm the driver in the form of a visual signal, audio signal[4].

V. Goll ,R.sundar and S. Hebbar [5] this literature mentioned 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 SIM to the police control room. In addition, when an ambulance is passing through the junction, it will inform to the traffic controller in the junction to turn on the green light.

In this system the wireless access point gather the information about potholes, it pass this information to BMC using wireless broadcast system. Traffic controller collect the environmental data also has an accelerator that can measure both the vertical and the horizontal acceleration. It is mostly used in accident detection system [6].

Seung-Ki Ryu and Taehyeong Kim,[7] A Guideline for Pothole Classification, in this proposed a paper classification of potholes are given explain. Potholes are summarized taking the help of location, length, shape and depth. There are multiple literature who gives us multiple technique to pothole detection and gives better survey and pavement quality with prior exploration and immediate action. For particular method it need for developing a classification guideline for supporting decision-making system of pothole repair.

In this paper[8] the author explain how road conditions are detected using smart phone sensor. This system has a sensors installed in vehicles. The basic 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.

In this study author [9] have developed a model based on Image Processing approach. In this paper Transformation is given for lane detection. Clustering based algorithm is used for detection of potholes. In this experimental results are tested on real time image database.

### III SYSTEM OVERVIEW

In the Proposed system, System can give alert information regarding the pothole for road safety purpose. In main system we classified into the four subsystems the sensing subsystem, the data processing subsystem, and the logging and reporting system and the power subsystem. Power subsystem start the vehicle and it enable the sensors and data processing module to start its working . The data processing module will examine the information from the sensors and output pothole data to the reporting and logging subsystem. The logging and reporting subsystem build on the android mobile device, will store the pothole locations on a network server.

Our system has mainly four modules, an mobile application module, server module, an microcontroller module and an sensing module. Various processes involved in these four module are:

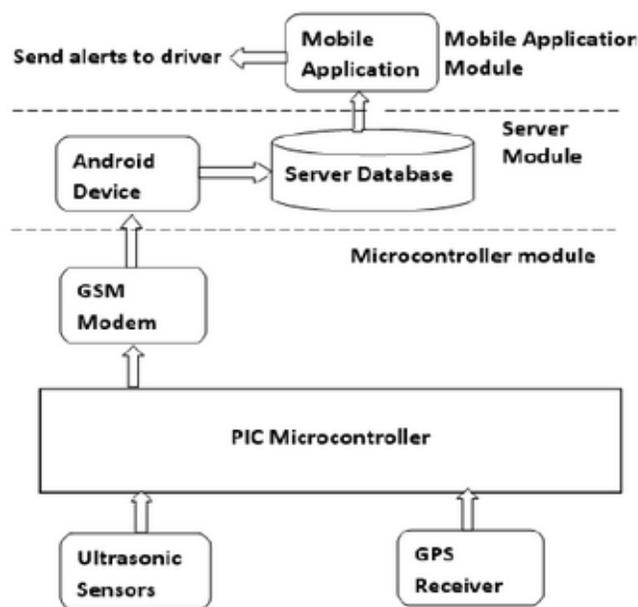


Figure 1. Block Diagram of Pothole Detection System

#### A. Mobile Application Module:

User can collect the pothole notification from the system for his safe journey.

#### B. Server Module :

The server module is nothing but the database for system. It is an Intermediate layer between sensing and mobile application module. Its function is to store the updated information received by the sensor and provide to the requested user whenever needed. This module can also be updated frequently for information related to the potholes and humps.

#### C. Microcontroller Module:

The Module is responsible for coordinating the hardware and server.

#### D. Sensing Module:

This model consists GPS receiver, ultrasonic sensor (HC-SR04) and GSM SIM 900 modem. The distances in between the car physical body and the road surface area is calculated with the help of an ultrasonic sensor. A threshold value is set such that the value based on ground clearance of the transport vehicle. The calculated distance(depth parameter) is compared with the threshold value to detect pothole or hump. If the calculated distance is greater when compared with the threshold value, then it is classified to be a pothole, and if the measured distance is less, then it is classified to be a hump. The location co-ordinates fetch by the GPS receiver, along with this data the information regarding the detected pothole or hump at a particular location co-ordinate is broadcast to the server using a GSM modem.

### IV SYSTEM ANALYSIS

#### A. System Description:

Input:

- Sensor array to listen to.
- Bit from sensor value if depth parameters need to be examined

Output:

- Each sensor array which distances in between them .
- Current Time.
- Trigger success bit.
- Bit from sensor value if system should be in operation.

Successful Condition:

- Collect precise distance values from each sensor outputs in an array.
- Acquires the current time when the function is called.
- Examine the speed data and the temperature of the sensor to see if the system is within the operating range set.

Failure Condition:

Our system fails when any hardware interrupted during vehicle journey.

We implement this system for avoiding the obstacle in our route for safe journey and maintain a vehicle proper condition. In this paper we use the following algorithm for implementation the detection system.

Input: Sensor Value.

Output: According to the system the of output is positive that is one when the proposed pothole detection system face the pothole in car journey.

Following code shows, how operations performed within the system and the sequence in which they are performed.

```

Sensorreadingarray [ ] //depth parameter
for (k=0 ; k isgreater noofsensor ;k++)
{
x=Sensorreadingarray[k]; //values will be check
y=Sensorreadingarray[k+1]; // through threshold to
    
```

```

if(abs(x-y) isgreater potholethreshold) //make sure
hardware function is not malfunction
{
    potholeflag = true; timestamp =currenttime;
}
}
    
```

**V SOFTWARE REQUIREMENT SPECIFICATION**

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 GPS receiver, ultrasonic sensor (HC-SR04) and GSM SIM 900 modem. Mobile application that communicates with vehicle driver using local server. We have calculated depth parameter it shows if there is pothole present or not.

**VI MATHMATICAL MODEL**

**B. Set Theory**

- For instant,
- A={U, S, D}
- Set U = {u1, u2, u3, u4}
- u1 = Available android systems.
- u2 = Hardware resources required.
- u3 = Detection pathhole for Execution.
- u4 = Analysis result through map.
- Set S = {s1, s2, s3, s4}
- S1 = Get user registration.
- S2 = Activate user for live services.
- S3 = Check the road condition path hole.
- S4 = Allocate Resources for Execution.
- Set D = {d1, d2, d3, d4, d5}
- d1 = Read location to be execute.
- d2 = Analysis of total pathhole.
- d3 = Resource Allocation hardware and software.
- d4 = Execution.
- d5 = Deployment.

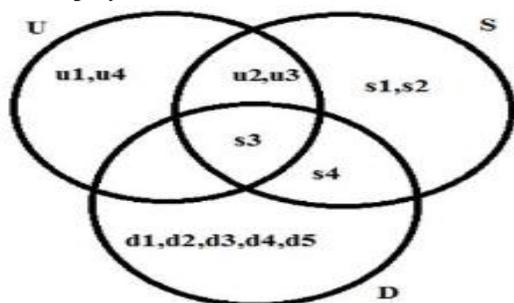


Figure 2. Set Theory

The pothole detection system is carried out by the intersection of above three sets.

**VII EXPERIMENTAL RESULT**

In this research paper, proposed system is practically achieve high accuracy and precision compared with existing

system which shown in following figure[3].

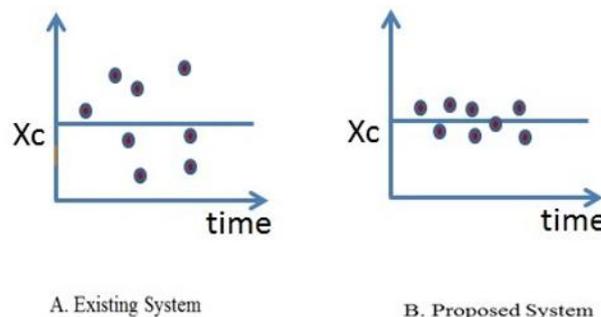


Figure. 3. Accuracy Of System.

The working of our proposed system was tested in simulated environment in which the demo model shows some pothole location. When pothole detected this information was recorded and later was stored in the database. Based on the detection potholes the alerts were sent from the stored information in the database.

**TABLE I**  
**RESULT ANALYSIS POTHOLE LOCATION**

Pothole	TimeStamp	Latitude	Longitude
1	7:03:32	41.07155	-81.01474
2	20:32:33	43.05274	-80..023399
3	2:03:04	38.06722	-107..034196

**VIII CONCLUSION**

Taking into account the current road scenarios, there is a need to devise a system alerts the driver regarding the upcoming pothole in vehicle journey. In our proposed system which aims at providing appropriate information to the driver about potholes. It is a low cost solution for the road safety purpose. This will help to avoid accidents and can use to identify pothole problem areas early. In countries where updated economic growth and excellent technology have increase to gives impact on the quality of traditional transport system over intelligent transportation system.

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