

Automatic Detection of Potholes and Humps on Roads to Aid Driver

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Abstract:

One of the major problems in developing countries is maintenance of roads. Well maintained roads contribute a major portion to the country's economy. Identification of pavement distress such as potholes and humps not only helps drivers to avoid accidents or vehicle damages, but also helps authorities to maintain roads. This paper discusses previous pothole detection methods that have been developed and proposes a cost-effective solution to identify the potholes and humps on roads and provide timely alerts to drivers to avoid accidents or vehicle damages. Ultrasonic sensors are used to identify the potholes and humps and also to measure their depth and height, respectively. The proposed system captures the geographical location coordinates of the potholes and humps using a global positioning system receiver. The sensed-data includes pothole depth, height of hump, and geographic location, which is stored in the database (cloud). This serves as a valuable source of information to the government authorities and vehicle drivers. An android application is used to update the pics of location on the android application named "meri sadak" so that measures can be taken to evade accidents. Alerts are given to the driver and simultaneously pics are updated on application.

1. Introduction

1.1 Motivation:

INDIA, the second most populous Country in World with fast growing economy, is known to have a gigantic network of roads. Roads are the dominant means of transportation in India today carrying almost 90 percent of country's passenger traffic and 65 percent of its freight. Roads in India normally have speed breakers so that the vehicle's speed can be controlled to avoid accidents. However, these speed breakers are unevenly distributed with uneven and unscientific heights. Potholes, formed due to heavy rains and movement of heavy vehicles, also become a major reason for traumatic accidents and loss of human lives. To address the above mentioned problems, a cost effective solution is needed that collects the information about the severity of potholes and humps and also helps drivers to drive safely.

1.2 Problem definition:

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, it is necessary to create an effective road surface monitoring system. Automated pot-hole detection is our focus in the system. The aim is to develop a system based on IOT to detect potholes on the road which will be uploaded on server and notified to all the user and update the information as required.

1.3 Objective of Project:

This paper discusses previous pothole detection methods that have been developed and proposes a cost-effective solution to identify the potholes and humps on roads and provide timely alerts to drivers to avoid accidents or vehicle damages. Ultrasonic sensors are used to identify the potholes and humps and also to measure their depth and height, respectively. The proposed system captures the geographical location coordinates of the potholes and humps using a global positioning system receiver.

2. Existing System:

INDIA, the second most populous Country in World with fast growing economy, is known to have a gigantic network of roads. Roads are the dominant means of transportation in India today carrying almost 90 percent of country's passenger traffic and 65 percent of its freight. However, most of the roads in India are narrow and congested with poor surface quality without maintenance. No matter where you are in India, driving is a breath- holding, multi-mirror involving, potentially life threatening affair.

2.1 Disadvantages of Existing system:

There is a loss of life due to the accidents happening on the roads majorly due to the bad conditions of the roads. Most of the accidents happens because of the uneven roads and it takes a long time by the officials to detect the uneven roads and repair it. These are the disadvantages of the existing system which we are going to overcome with this project.

3. Proposed System:

In this project, we have proposed system which will detect the potholes on the road and save the information in the server. Due to the rains and oil spills potholes are generated which will

cause the accidents. The potholes are detected and its height, depth and size are measured using ultrasonic sensor. The GPS is used to find the location of pothole. All the information is saved in the database. This timely information can help to recover the road as fast as possible. Hence the system will help to avoid road accidents. The mobile application used in this system is an additional advantage as it provides timely alerts about potholes and humps.

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4.Content diagram of Project:

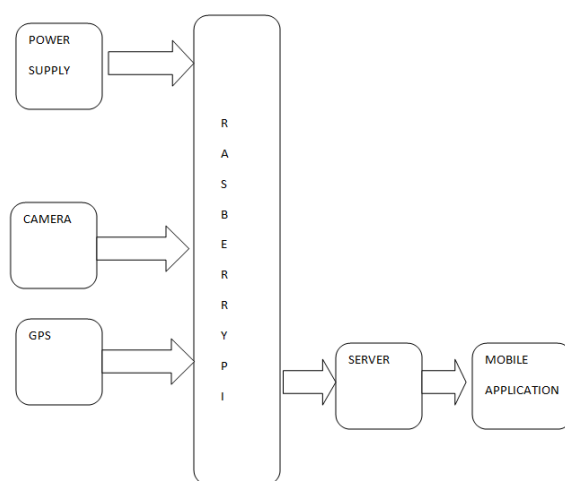


Fig 1 Block Diagram

4.1 Architecture:

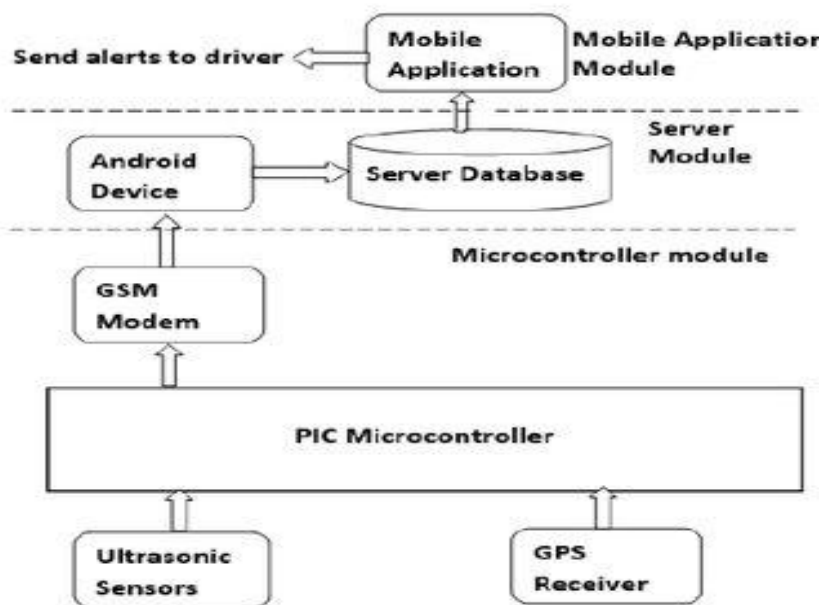


Fig 2 Architecture

The system architecture of the pothole detection system is as shown. The system consists of sensor, GPS receiver and a computer which processes the received data. The processed data is then used for a database creation of the potholes and humps and their depths and locations. In this project report we described about ultrasonic sensor, Wi-Fi technology, GPS receiver and implementation of pothole detection system, also benefits of the system. We have achieved our target of detecting the pothole and humps.

5. Implementation

5.1 Introduction

Pavement distress detection is an intriguing topic of research and researchers have been working on potholes and humps detection techniques. The Microcontroller was an overnight success, and its use increased steadily over the next decade. Early embedded applications included unmanned space probes, computerized traffic lights, and aircraft flight control systems. In the 1980s, embedded systems quietly rode the waves of the microcomputer age and brought

microprocessors into every part of our kitchens (bread machines, food processors, and microwave ovens), living rooms (televisions, stereos, and remote controls), and workplaces (fax machines, pagers, laser printers, cash registers, and credit card readers).

It seems inevitable that the number of embedded systems will continue to increase rapidly. Already there are promising new embedded devices that have enormous market potential; light switches and thermostats that can be central computer, intelligent air-bag systems that don't inflate when children or small adults are present, pal-sized electronic organizers and personal digital assistants (PDAs), digital cameras, and dashboard navigation systems. Clearly, individuals who possess the skills and desire to design the next generation of embedded systems will be in demand for quite some time.

5.2.Method of Implementation:

5.2.1 Output Screen



Fig 3: Notification of application



Fig 4: Alert messages sent to driver



Fig 5 Module kit

Sl No	Obstacle Type	Height/Depth in cms	Latitude	Longitude
1	P	19.35	13.8532	78.5455
2	H	3.1	13.8406	78.5571
3	H	3.8	13.8421	78.5578
4	P	13.2	13.8434	78.5579
5	P	8.7	13.8411	78.5564
6	P	6.3	13.8423	78.5560
7	H	2.3	13.8517	78.5659
8	P	15.8	13.8555	78.5679
9	H	3.1	13.8502	78.5569
10	P	18.2	13.8532	78.5670

Table: Details of the potholes and humps

The goal of software design is simplicity. Each class, method, and module in your code should have a single purpose. Every new task should get its own module that we can use and modify independently. This minimizes regressions and makes the code easier to use. All the modules have been executed concurrently without occurrence of errors.

5.3.Design of Test-cases & Scenarios

A test case is a set of rules or conditions to check if the system or one of its feature works in accordance to the requirement. It is a document with a set of details which includes, set of test data, expected results, actual results, environment information and soon

Test case ID	Test-case Type	Test-case Description	Expected Value	Actual Value	Result
1	When the road is clear	When they are no potholes detected	There should be no value of potholes or humps	The device doesnt give any alert messages	Success
2	When the Pothole is detected	The system detects the potholes	The depth of the pothole is measured	The device sends the alert message to driver	Success
3	When the Hump is detected	The system detects the hump	The height of the hump is measured	The device sends the alert message to driver	Success

4	Take the picture of pothole or hump	When the pothole is detected by the system a picture is to be taken by camera	Picture of the hump or pothole	The picture is send to the database	Success
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Table : Test cases

6.Conclusion

In this project, we have proposed system which will detect the potholes on the road and save the information in the server. Due to the rains and oil spills potholes are generated which will cause the accidents. The potholes are detected and its height, depth and size are measured using ultrasonic sensor. The GPS is used to find the location of pothole. All the information is saved in the database. This timely information can help to recover the road as fast as possible. Hence the system will help to avoid road accidents. The mobile application used in this system is an additional advantage as it provides timely alerts about potholes and humps. This serves as a valuable source of information to the government authorities and to vehicle drivers. It will save many lives and ailing patients who suffer from tragic accidents .Well maintained roads contribute a major portion of the country's economy. In our project we are using single node.

6.1.Future Enhancement

In future it may require one data base server. if we are using n number of nodes we have to make a cloud. It can be integrated in the proposed system to improve user experience.Also, Google maps and SATNAV can be integrated in the proposed system to improve user experience.A more complex prototype can be developed so as to control the speed of the vehicle when there is pothole ahead. After successful completion of this project we can conclude that, Thus we have successfully made a working model of Automatic Detection and Notification of Potholes and humps on roads to aid drivers. This model is simple and less complex as compared to others it has very vast future development scope

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