AUTOMATIC DETECTION OF POTHOLES AND HUMPS AND ALERTING VEHICLE DRIVERS TO EVADE POTENTIAL ACCIDENTS

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Abstract - Road maintenance is one of the biggest issues in developing countries. Roads that are well-maintained contribute significantly to the economy of the country. The detection of pavement distress, such as potholes and humps, not only aids drivers in avoiding accidents and car damage, but also aids authorities in road maintenance. This study reviews prior pothole detection technologies and provides a cost-effective technique for detecting potholes and humps on roadways and alerting drivers in time to avert accidents or vehicle damage. Potholes and humps are detected using ultrasonic sensors, which can also be used to assess their depth and height. Using a GPS receiver, the suggested method gathers the geographical location coordinates of potholes and humps. The database stores the detected data, which includes pothole depth, hump height, and geographic location (cloud). This is a vital source of information for government officials as well as automobile drivers. Drivers are notified via an Android application, allowing them to take preventative measures to avoid accidents. Alerts are sent as flash messages with an audible beep.

Keywords- Android application, Ultrasonic sensors.

1. INTRODUCTION

India, the world's second most populous country and a fast-growing economy, is noted for its vast road network. In today's India, roads are the most common mode of transportation. They transport about 90% of the country's passengers and 65% of its freight. However, the majority of India's roadways are narrow and overcrowded, with low surface quality and maintenance requirements are not being met in a satisfactory manner. Driving in India is a breath-holding, multi-mirror involved, potentially life-threatening experience no matter where you are. The number of vehicles on the road has increased dramatically in the last two decades. Traffic congestion and an increase in the frequency of road accidents have resulted from the expansion of vehicles. Roads in poor condition is a factor that contributes to traffic congestion and accidents. Researchers are

working on traffic congestion control [2], an important component of vehicular area networks that is urgently needed nowadays. Speed breakers are commonly seen on Indian roads, allowing drivers to limit their vehicle's speed and avoid accidents. These speed breakers, on the other hand, are unevenly placed with unequal and unscientific heights.

2. LITERATURE REVIEW

Rajeshwari S, et al. [2] uses an intelligent traffic control system to pass emergency vehicles smoothly. Each individual vehicle is equipped with special RFID tag(placed at a strategic location), which makes it impossible to remove or destroy. We use RFID reader, NSK EDK-125–TTL and PIC16F877A system-onchip to read the RFID tags attached to the vehicle. It counts number of vehicles that passes on a particular path during a specified duration. It also determines the network congestion, and hence the green light duration for that path.

I. Moazzam [3] discusses about Pavement distress and wear detection is of prime importance in transportation engineering. Due to degradation, potholes and different types of cracks are formed and they have to be detected and repaired in due course. Estimating the amount of filler material that is needed to fill a pothole is of great interest to prevent any shortage or excess, thereby wastage, of filler material that usually has to be transported from a different location. Metrological and visualization properties of a pothole play an important role in this regard.

Jin Lin et al. [6] proposes a 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 results show that the algorithm can achieve a high recognition rate.

Faith Orhan et al. [7] monitored The sensing, computing and communicating capabilities of smart phones bring new possibilities for creating smart applications, including in-car mobile applications for smart cities. However, due to the dynamic nature of vehicles, many requirements such as sensor management, signal and image processing or information sharing needs exist when developing a smart sensor-based in-car mobile application. On the other hand, most in-car applications generally employ single-modal sensor analysis, which also yields limited results. Using the advanced capabilities of smart phones, this study proposes a framework with built-in multimodal sensor analysis capability, and enables easy and rapid development of signal and image processing-based smart mobile applications.

3. PROPOSED SYSTEM

The suggested system provides a low-cost method of identifying potholes and humps on highways and alerting cars to their presence.

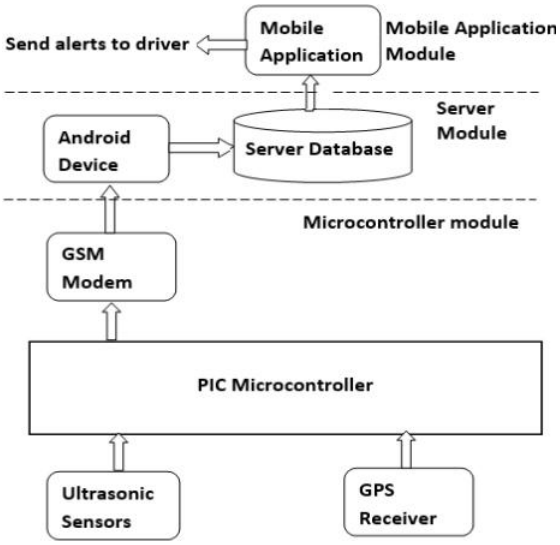

Fig 1: Block diagram of the Proposed System

Figure 3 depicts the proposed system's architecture. It is made up of three parts: a microcontroller, a server, and a mobile application module. The microcontroller module collects information on potholes and humps, as well as their geographic positions, and sends it to the server. The server module gets data from the microcontroller and processes it before storing it in the database. The mobile application module accesses data from the server database and sends timely notifications to the driver.

3.1 Microcontroller module:

The PIC 16F877A microprocessor, ultrasonic sensors, GPS receiver, and GSM modem are all included in this module. The distance between the automobile body and the road surface is measured using ultrasonic sensors, and the data is sent to the microcontroller. The threshold distance is the distance between the car body and the ground on a smooth road surface. The threshold value is determined by the Vehicles' ground clearance can be adjusted accordingly. It's a pothole if the distance detected by the ultrasonic sensor is larger than the threshold; it's a hump if it's smaller; otherwise, it's a smooth road. The GPS receiver records the position coordinates of the observed pothole or hump and uses a GSM modem to transmit signals to the registered mobile SIM. On the android handset that serves as the server, this registered mobile SIM is present. The notifications contain information such as the depth of the pothole or the height of the hump, as well as the coordinates of its location.

3.2 Micro controller:

The microcontroller is the main component in this project. Microcontrollers were first employed as parts of complicated method manipulation systems. Micro-controllers, on the other hand, are used in regulators for individual control loops because of their small size and low power consumption. Microcontrollers exceed their analogue counterparts in a number of areas and are also less expensive.

3.3 Server module:

The android device and the database are the two components of this module. Between the microcontroller module and the mobile application, it serves as an intermediary layer. The server module is an android application that runs on a device and is responsible for reading messages sent by the microcontroller module's registered mobile SIM. The contents of this message are processed and stored in the database (cloud). It is feasible to provide broader access

to sensor data by integrating sensor networks with cloud and Internet of Things.

3.3 Mobile application module:

This module is developed as an android application that is put on the car driver's phone and provides real-time alerts concerning potholes and humps. This application's workflow is depicted in Figure 4. The programme operates in the background of the phone at all times. It first collects the vehicle's current geographic location before accessing the sites The server database contains a list of potholes and humps. The distance between the vehicle and the database-stored pothole location is calculated. An alarm message appears on the mobile screen if the distance between the two is less than 100 metres. This message includes an audible beep to help the driver distinguish it from other flash messages.

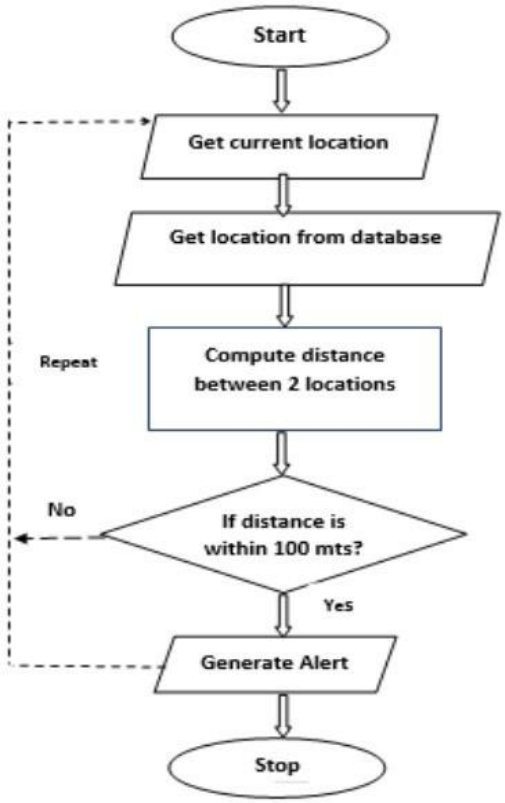

Fig. 2 Working flow model

4. PROTOTYPE RESULTS

Figure 5 depicts the suggested system's working model. It was put to the test in a controlled environment with simulated potholes and humps. The unit was also put through its paces by mounting it on a motorcycle (Honda Activa). The tests were conducted in two stages. The initial phase involved recording and storing information about potholes and humps on a server database. Alerts were generated in the second phase based on pothole and hump data recorded in the database. The microcontroller module was mounted on a toy automobile and the threshold value was set to 5 cm when testing in the simulated environment. During the tests, it was discovered that the microcontroller module identified potholes and humps as expected.

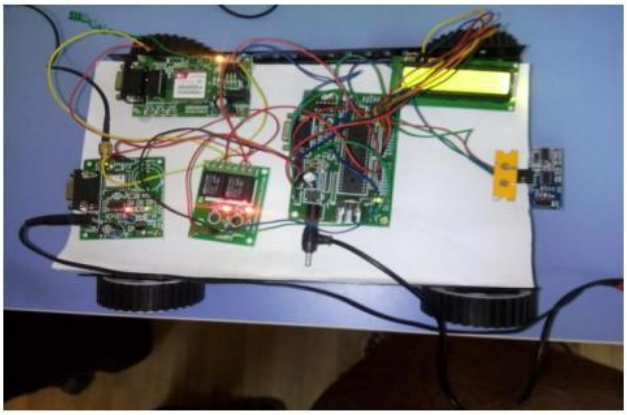

Fig. 3 Working model of the proposed system

Fig. 4 Two wheeler bike for Testing

The proposed model's real-time testing The microcontroller module was mounted on a Honda Activa, and the threshold distance value was set to 16 cm, which corresponds to the vehicle's ground clearance. The vehicle was driven on Bangalore streets in order to collect data on potholes and humps, and the findings were as expected.

Fig. 5 Detection result

5. CONCLUSION

The approach suggested in this study accomplishes two crucial goals: automatic detection of potholes and humps, and notifying vehicle drivers to avoid probable collisions. Because it employs low-cost ultrasonic sensors, the proposed method is a cost-effective option for detecting awful potholes and uneven humps. This system's mobile application is an added benefit because it gives Pothole and humps notices are sent out on a regular basis. The method also works during the rainy season, when potholes are filled with muddy water, because notifications are created based on the database information. We believe that the method presented in this paper has the potential to save many lives and sick people who have been injured in horrific events.

REFERENCES

1. India Transport Sector. [Online]. Available : http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/EXTSARREGTOPTRANSPORT/0,,contentMDK:20703625~menuPK:868822~pagePK:34004173~piPK:34003707~theSitePK:579598,00.html

2. Rajeshwari S., Santhosh Hebbar, Varaprasad G., “Implementing Intelligent Traffic Control System for Congestion Control, Ambulance Clearance and Stolen Vehicle Detection”, IEEE Sensors Journal, Vol.15, No.2, pp.1109-1113, 2015

, M. Rahman, “Metrology and Visualization of Potholes using the Microsoft Kinect Sensor”, In Proceedings of IEEE Conference on Intelligent Transport System, pp.1284-1291, 2013.

4. Sudarshan S. Rode, Shonil Vijay, Prakhar Goyal, Purushottam Kulkarni, Kavi Arya, “Pothole Detection and Warning System”, In Proceedings of International Conference on Electronic Computer Technology, pp.286-290, 2009.

5. He Youquan, Wang Jian, Qiu Hanxing, Zhang Wei, Xie Jianfang, "A Research of Pavement Potholes Detection Based on Three-Dimensional Project Transformation", In Proceedings of International Congress on Image and Signal Processing, pp.1805- 1808, 2011.

6. Jin Lin, Yayu Liu, "Potholes Detection Based on SVM in the Pavement Distress Image", In Proceedings of International Symposium on Distributed Computing and Applications to Business, Engineering and Science, pp.544-547,2010

7. Faith Orhan, P. Erhan Eren, "Road Hazard Detection and Sharing with Multimodal Sensor Analysis on Smartphones", In Proceedings of International Conference on Next Generation Mobile Apps, Services and Technologies, pp. 56-61, 2013.

8. Artis Mednis, Girts Strazdins, Reinholds Zviedris, Georgijs Kanonirs, Leo Selavo, "Real Time Pothole Detection using Android Smartphones with Accelerometers", In Proceedings of Distributed Computing in Sensor Systems Workshop, pp.1-6, 2011.

9. Zhen Zhang, Xiao Ai, C. K. Chan and Naim Dahnoun, "An Efficient Algorithm for Pothole Detection using Stereo Vision", In Proceedings of IEEE Conference on Acoustic, Speech and Signal Processing, pp.564-568, 2014.

10. Mircea Strutu, Grigore Stamatescu, Dan Popescu, "A Mobile Sensor Network Based Road Surface Monitoring System", In Proceedings of IEEE Conference on System Theory, Control and Computing, pp.630–634, 2013.