Detection And Notification of Potholes And Humps And Automation of Vehicles By Using Raspberry Pi

Kalyani N.Tonge[1], Prof. S.K Bhatia[2]
[1] Dept of ENTC ICOER
[2]Pofessor, Dept of ENTC ICOER
[1, 2] Pune University Wagholi Pune, Maharashtra India

Abstract- *The maintenance of the street is one of the significant issues in the creating countries. Accidents can be happen 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. Pothole location techniques have been produced to give a cost-effective solution to identify the potholes and humps on streets. It gives convenient alarms to a driver which helps them in maintaining a strategic distance from vehicle harm. Ultrasonic sensors are utilized to recognize the potholes and humps and also to measure their depth and height, respectively. The proposed framework catches the geological area directions of the potholes and humps utilizing a Global Positioning System (GPS). The detected information incorporates pothole, hump, and geographic location, which is stored in the Database. Once you get data from the database, It will mapped with the GPS navigation . Automation of vehicles is done utilizing Raspberry Pi - 3. Liquor sensor, temperature sensor, seatbelt sensor information is in simple frame. It is changed over into digital value by utilizing MCP 3204 ADC.*

Keywords- Android application, GPS, ultrasonic sensors, Raspberry Pi

I. INTRODUCTION

India, the second most popular Country in the World and a fast growing economy, is known to have a gigantic network of roads. Roads are the dominant means of transportation in India today. They carry 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 and road maintenance needs are not satisfactorily met. No matter where you are in India, driving is a breath-holding, multi-mirror involving, potentially life threatening affair. Over the last two decades, there has been a tremendous increase in the vehicle population. This proliferation of vehicles has led to problems such as traffic congestion and increase in the number of road accidents. Pathetic condition of roads is a boosting factor for traffic congestion and accidents. Researchers are working in the area of traffic congestion control, an integral part of vehicular area networks, which is the need of the hour today. 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. According to the survey report "Road Accidents in India, 2011", by the ministry of road transport and highways, a total of 1,42,485 people had lost their lives due to fatal road accidents. Of these, nearly 1.5 per cent or nearly 2,200 fatalities were due to poor condition of roads. Figure 1 portrays the condition of roads with killer potholes. 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. Over the past few years, there has been a largeincrease 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 signalsand 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

II. LITERATURE SURVEY

Pavement distress detection is an intriguing topic of research and researchers have been working on pothole detection techniques. This section gives a brief description about the existing solutions for detecting potholes and humps on roads.

I. Moazzam, et al [1] have proposed a low cost model for analysing 3D pavement distress images. It makes use of a

low cost Kinect sensor, which gives the direct depth measurements, thereby reducing computing costs.These images are analysed using MATLAB environment, by extracting metrological and characteristic features, to determine the depth of potholes.Youquan, et al [2] developed a model to detect the three-dimensional cross-section of pavement pothole. The method makes use of LED linear light and two CCD (Charge Coupled Device) cameras to capture pavement image.results get affected by LED light intensity and environmental factors. Jin Lin, et al [3], have proposed a method for pothole detection based on SVM (Support Vector Machine). This method distinguishes potholes from other defects such as cracks. The images are segmented by using partial differential equations. In order to detect potholes, the method trains the SVM with a set of pavement images. Faith Orhan, et al [4], have proposed a work developed on android platform to detect road hazards. There are three components in this proposed work viz, Sensing component, Analysis component and Sharing component. The sensing component basically works by collecting raw data from accelerometer and synchronizes with interface, hence leading to ease of access. The developed framework is connected with the central application, where it can directly communicate with the social network. All the collected data is stored at central repository for further processing. Although this method communicates traffic events with other drivers, it increases the cost and complexity of implementation.

Artis Mednis, et al [5] have proposed a real time pothole detection model using Android smartphones with accelerometers. Modern smart phones with android OS, have inbuilt accelerometers, which sense the movement and vibrations. The accelerometer data is used to detect potholes. Different algorithms such as Z-thresh, which measures the acceleration amplitude at Z-axis, Z-diff to measure the difference between the two amplitude values, STDEV (Z) to find the standard deviation of vertical axis acceleration and G-Zero are used to identify potholes. Zhen Zhang, et al [6] have made use of stereo camera images coupled with a disparity calculation algorithm to identify potholes. Mircea Strutu, et al [7] have proposed a method for detecting defects on the road surface using accelerometers. It also makes use of GPS system to identify the exact location of the defects. Pothole detection algorithm runs on a mobile platform (moving vehicles), which is installed with accelerometer, GPS, local computer and a wireless router. Installing wireless router and local computer on all mobile platforms and setting up access points turns out to be quite expensive. Sachin Bharadwaj, et al [8], have proposed a system that detects potholes based on a vision based approach. It is a 2D vision based solution and works only under uniform lighting conditions and also the system does not involve any kind of warning system. The above solutions are limited only to the identification of a pothole. Sudarshan S. Rode, et al [9], have proposed a system in which, Wi-Fi equipped vehicles collect information about the road surface and pass it to the Wi-Fi access point. The access point then broadcasts this information to other vehicles in the vicinity in the form of warnings. Sandeep Venkatesh, et al [10] have proposed an intelligent system that has made use of laser line striper and a camera to detect and avoid potholes. This system maintains a centralized database of the location of potholes. It also sends warning messages to the nearby vehicles about the occurrence of potholes using Dedicated Short Range Communication protocol. Shambhu Hegde, et al [11], have proposed an intelligent transport system to detect potholes. It makes use of ultrasonic sensors to detect the presence of potholes. This system also sends warning messages to all the vehicles in the range of 100 meters using Zigbee module. Prachi More, et al [12], proposed a system where sensors are mounted on public vehicles. These sensors record vertical and horizontal accelerations experienced by vehicles on their route. The installed GPS device logs its corresponding coordinates to locate potholes and the collected data is processed to locate potholes along the path traversed earlier by the vehicle. robot stops and camera moves to take pictures of the pothole while GPS device locates its coordinates. Although this is a cost effective solution, it is restricted to collecting information about potholes. X. Yu, et al [13], implemented a system that uses laser imaging for detecting potholes. Pavement distress such as pothole is detected when the laser source deformation is observed in the captured images. Different techniques such as multi-window median filtering and tile partitioning are applied to detect the presence of potholes. These potholes are further classified based on their shapes and severity. Although this is an accurate and efficient method for detecting potholes, the cameras capture shaky images due to uneven road surface, which reduces the efficiency of pothole detection.

III. CONCLUSIONS

The model proposed in this paper serves 2 important purposes; automatic detection of potholes and humps and alerting vehicle drivers to evade potential accidents. The proposed approach is an economic solution for detection of dreadful potholes and uneven humps, as it uses low cost ultrasonic sensors. The mobile application used in this system is an additional advantage as it provides timely alerts about potholes and humps. The solution also works in rainy season when potholes are filled with muddy water as alerts are generated using the information stored in the database. We feel that the solution provided in this paper can save many lives and ailing patients who suffer from tragic accidents.

The proposed system considers the presence of potholes and humps. However, it does not consider the fact that potholes or humps get repaired by concerned authorities periodically. This system can be further improved to consider the above fact and update server database accordingly. Also, Google maps and SATNAV can be integrated in the proposed system to improve user experience.

The solution provided in literature paper overcomes two major problems that concern the people the most and which leads to frequent accidents; The proposed work is more economical as it uses a low cost ultrasonic sensor and a pressure sensor. This model also works when potholes are filled with water and gives the message to user.

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