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Detection of Speed Humps/Dumps and Speed Controlling

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ABSTRACT: Smartphones are potentially useful to be adopted as a cost-effective and easy to implement tool for the measurement of road surface roughness condition, which is very essential for road monitoring and maintenance planning. In this study, an experiment has been carried out to collect data from accelerometers and gyroscopes on smartphones. The collected data is processed in the frequency domain to calculate magnitudes of the vibration. Road roughness condition that is modeled as a linear function of the vibration magnitudes, taking into account of both data from accelerometer and gyroscope as well as the average speed, achieves better estimation than the model that takes into account the magnitude from the accelerometer and the average speed alone. The finding is potentially significant for the development of a more accurate model and a better smartphone app to estimate road roughness condition from smartphone sensors.

KEYWORDS: Potholes, Speed Breakers, Raspberry Pi, Camera, Statistical Analysis, Firebase

I. INTRODUCTION

India, the second most crowded Country in the World and a quickly developing economy, is known to have a monstrous system of streets [1]. Streets are the overwhelming method for transportation in India today. They convey right around 90 percent of nation's traveler movement and 65 percent of its cargo. Be that as it may, the vast majority of the streets in India are restricted and congested with poor surface quality and street support needs are not agreeably met. Regardless of where you are in India, driving is a breath-holding, multi-reflect including, possibly life undermining undertaking [1]

In the course of the most recent two decades, there has been an enormous increment in the vehicle populace. This expansion of vehicles has prompted to issues, for example, activity clog and increment in the quantity of street mishaps. Pitiable state of streets is a boosting component for activity blockage and mishaps. Scientists are working in the zone of movement blockage control , an indispensable piece of vehicular zone systems, which is the need of great importance today. [1]

Streets in India typically have speed breakers so that the vehicle's speed can be controlled to stay away from mischances. Be that as it may, these speed breakers are unevenly conveyed with Potholes, framed because of overwhelming downpours and development of substantial vehicles, likewise turn into a noteworthy purpose behind traumatic mishaps and loss of human lives. As per the study report "Street Accidents in India, 2011", by the service of street transport and thruways, a sum of 1,42,485 individuals had lost their lives because of lethal street mishaps. Of these, about 1.5 for each penny or almost 2,200 fatalities were because of poor state of streets [2]. According to the Road Accident Report (2014) published by the road transport and highways ministry, while 4,726 lives were lost in crashes due to humps, 6,672 people died in accidents caused due to potholes and speed breakers. For the first time, the government recorded deaths caused by potholes, speed breakers and humps on roads [2]. Last year, about 11,400 people died Figure 1 depicts the state of streets with executioner potholes. To address the previously mentioned issues, a savvy arrangement is required that gathers the data about the seriousness of potholes and bumps furthermore helps drivers to drive securely. With the proposed framework an endeavor has been made to support drivers to avoid the mischances brought about because of potholes and raised protuberances. The rest of the areas of the paper are as per the following: segment II underscores on the related work that has been done and is going ahead in the field of identification of potholes and protuberances. Area talks about the different segments utilized as a part of the proposed framework. Area portrays the design and usage of the proposed framework. Trial consequences of the proposed work are displayed in Section. Segment discusses conclusion and future degree.

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Figure 1 Condition of roads with potholes [1].

Necessity

Roads are the one of the main transportation system amongst the other especially when we talking about developed and developing countries. India is said to be the fastest developing countries today, our road network is gigantic and said to be only after the USA. But one of the striking underlying facts is the condition of the roads. Since roads indirectly contribute to the economic growth of the country it is extremely essentially that the roads are well laid out and strong. India is home to several bad roads it the metropolitans, the cities or the villages [1]. 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. For that 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) [3]. This serves as a valuable source of information to the government authorities and vehicle drivers. An android application is used to alert drivers so that precautionary measures can be taken to avoid accidents. Alerts are given in the form of flash messages with an audio beep.

II. LITERATURE SURVEY

This chapter will include the literature survey in which the literature review of the papers which are referred is included. It will also include all the background subtraction techniques and their drawbacks.

AlessioCarullo and Marco Parvis has proposed "An Ultrasonic Sensor for Distance Measurement in Automotive Applications" [4]

This paper describes an ultrasonic sensor that is able to measure the distance from the ground of selected points of a motor vehicle. The sensor is based on the measurement of the time of flight of an ultrasonic pulse, which is reflected by the ground. A constrained optimization technique is employed to obtain reflected pulses that are easily detectable by means of a threshold comparator. Such a technique, which takes the frequency response of the ultrasonic transducers into account, allows a sub-wavelength detection to be obtained. Experimental tests, performed with a 40 kHz piezoelectric-transducer based sensor, showed a standard uncertainty of 1 mm at rest or at low speeds; the sensor still works at speeds of up to 30 m/s, although at higher uncertainty. The sensor is composed of only low cost components, thus being apt for first car equipment in many cases, and is able to self-adapt to different conditions in order to give the best results.

the development of "smart cars" requires new sen-sors that are able to measure distances in the range of a few centimeters to a few meters. Parking aids, as well as intelligent suspensions and headlight leveling, are some examples of fea-tures that require a distance measurement to be performed with contactless sensors. Several different physical principles can be employed to measure the distance, but price limits greatly restrict the actual choices.

An interesting possibility, which has been investigated by several authors, is the use of ultrasonic sensors based on the well known time of flight technique .Such sensors are reasonably cheap and work for ranges of up to a few meters, even though problems arise regarding both their accuracy and their behavior in noisy open-air conditions.

In this paper the authors describe a low-cost ultrasonic dis-tance meter that performs contactless measurement of the height from the ground of a vehicle body. The sensor performance is better than many commercial devices, thanks to the possibility the sensor has of evaluating the environmental conditions and then self-adapting to these conditions.

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Fagen Li and Pan Xionghas proposed "Practical Secure Communication for Integrating Wireless Sensor Networks Into the Internet of Things" [5]

If a wireless sensor network (WSN) is integrated into the Internet as a part of the Internet of things (IoT), there will appear new security challenges, such as setup of a secure channel between a sensor node and an Internet host. In this paper, we propose a heterogeneous online and offline sign cryption scheme to secure communication between a sensor node and an Internet host. We prove that this scheme is indistinguishable against adaptive chosen ciphertext attacks under the bilinear Diffie-Hellman inversion problem and existential unforgeability against adaptive chosen messages attacks under the q-strong Diffie Hellman problem in the random oracle model. Our scheme has the following advantages. First, it achieves confidentiality, integrity, authentication, and non-repudiation in a logical single step. Second, it allows a sensor node in an identity-based

cryptography to send a message to an Internet host in a public key infrastructure. Third, it splits the signcryption into two phases:

i) offline phase; and ii) online phase. In the offline phase, most heavy computations are done without the knowledge of a message. In the online phase, only light computations are done when a message is available. Our scheme is very suitable to provide security solution for integrating WSN into the IoT.

The Internet of Things (IoT) is a novel paradigm that has received considerable attention from both academia and industry. The basic idea of IoT is the pervasive presence around us of a variety of things or objects-such as radio-frequency identification (RFID) tags, sensors, actuators, mobile phones, etc.-which, through unique addressing schemes, are able to interact with each other and cooperate with their neighbors to reach common goals. Wireless sensor networks (WSNs) are ad hoc networks which usually consist of a large number of tiny sensor nodes with limited resources and one or more base stations. Usually, sensor nodes consist of a processing unit with limited computational power and limited capacity. On the other hand, the base station is a powerful trusted device that acts as an interface between the network user and the nodes.

Moazzam, K. Kamal, S. Mathavan, et.al. "Metrology and Visualization of Potholes using the Microsoft Kinect Sensor Intelligent Transportation Systems" [6]

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. Using a low-cost Kinect sensor, the pavement depth images are collected from concrete and asphalt roads. 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 area-depth curves through pavement image analysis. In addition pothole area, length, and width are estimated. The paper also proposes a methodology to characterize potholes.

MirceaStrutu, GrigoreStamatescu, Dan Popescu "A Mobile Sensor Network Based Road Surface Monitoring System" [7]

This paper presents a road surface defect identification system based on 3D accelerometers, GPS and video modules deployed on vehicles. The mobile platform architecture and the central data aggregation algorithm are also discussed. Because the mobile system is deployed over a large outdoor area, we also present a solution for the wireless communication coverage problem. Finally, we are highlighting the importance of the gathered information by making it available for the users using a GIS platform.

A well maintained road network is a must for the economic development and the well being of people in any country . Every year, especially after colder periods of time, authorities have to deal with lots of complains regarding the poor condition of the roadways. Many drivers regard potholes as driving hazards and blame them not only for damaging their cars, but even for causing accidents. Bad roads also count for slower, more energy consuming and polluting traffic.

X. Yu and E. Salari "Pavement Pothole Detection and Severity Measurement Using Laser Imaging" [8]

Over the years, AutomatedImage Analysis Systems (AIAS) have been developed for pavement surface analysis and management. The cameras used by most of the AIAS are based on Charge-Coupled Device (CCD) image sensorswhere a visible ray is projected. However, the quality of the images captured by the CCD cameras was limited by the inconsistent illumination and shadows caused by sunlight. To enhance the CCD image quality, a high-power artificial lighting system has been used, which requires a complicated lighting system and a significant power source. In this paper, we will introduce an efficient and more economicalapproach for pavement distress inspection by using laser imaging. After the pavement images are captured, regions corresponding to potholes are represented by a matrix of square tiles and the estimated shape of the pothole is determined. The vertical, horizontal distress measures, the total number of distress tiles and the depth index information are calculated providing input to a Three layer feed-

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forward neural network for pothole severity and crack type classification. The proposed analysis algorithm is capable of enhancing the pavement image, extracting the pothole from background and analyzing its severity. To validate the system, actual pavement pictures were taken from pavements both in highway and local roads. The experimental results demonstrated that the proposed model works well for pothole and crack detection

Rajeshwari S., SanthoshsHebbar, VaraprasadGolla "Implementing Intelligent Traffic Control System for Congestion Control, Ambulance Clearance and Stolen Vehicle Detection" [9]

This paper presents 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-on-chip 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. If the RFID-tag-read belongs to the stolen vehicle, then a message is sent using GSM SIM300 to the police control room. Also, when an ambulance is approaching the junction, it will communicate to the traffic controller in the junction to turn on the green light. This module uses ZigBee modules on CC2500 and PIC16F877A system-on-chip for wireless communications between the ambulance and traffic controller. The prototype was tested under different combinations of inputs in our wireless communication laboratory and experimental results were found as expected.

India is the second most populous Country in the World and is a fast growing economy. It is seeing terrible road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints. Also, Indian traffic is non-lane based and chaotic. It needs a traffic control solutions, which are different from the developed Countries. Intelligent management of traffic flows can reduce the negative impact of congestion. In recent years, wireless networks are widely used in the road transport as they provide more cost effective options.

III. PROPOSED SYSTEM

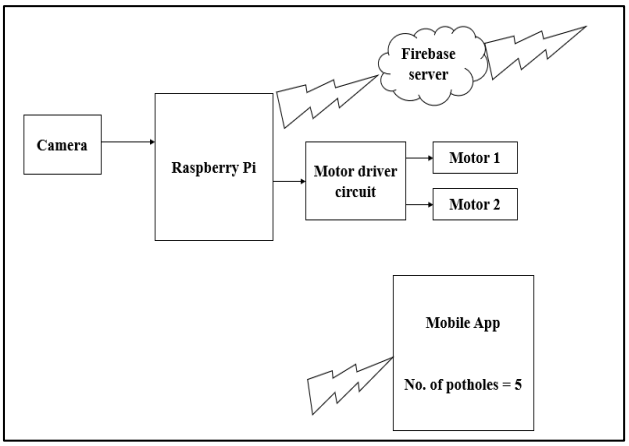

Fig:1.Proposed system

The above figure represents the block diagram of the proposed system. Camera is used to capture the real time video. The required frame is extracted. This frame will undergo various steps of statistical analysis that are explained above. The output of statistical analysis is then sent as in input to the look up table which is the decision maker. Depending on the input, it will decide whether the vehicle has detected a pothole or speed breaker. If it is a pothole, the pothole counting counter will be incremented by 1 and the total number of potholes will be updated and displayed on mobile app. Firebase server is used to send data on cloud from where MIT App inventor fetches the data and displays on its app. If the vehicle has detected a speed breaker, in this case the speed of the vehicle will be reduced automatically until the vehicle passes the speed breaker.

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IV. RESULT

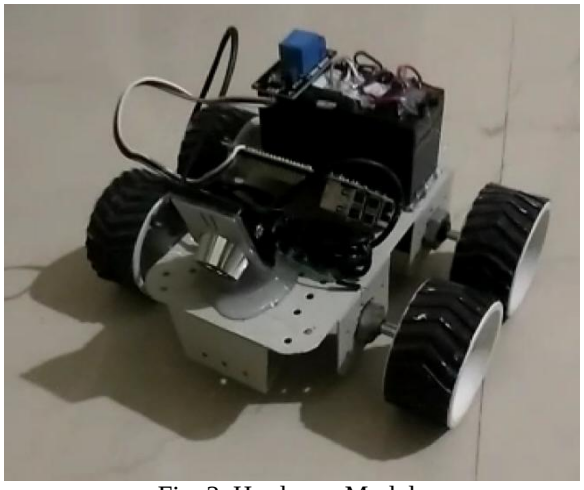

Fig .2. Hardware Module

Fig.3. Sign In

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Fig.3. Login

Fig.4. View Results

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Fig 5.Map

V. CONCLUSION

The working of the experiment is done with the real time applications .And it was almost tested with the artificial potholes and humps by fixing the experiment in the bike and car and the first test was taken to record and stored in the data base, the second test was taken to find the alerts were generated based on the humps and potholes in the road by the detection of ultrasonic sensor. The mobile application is the advance technology used additional to this system were it provides the alert to the drivers while driving the vehicle .Where the solution of the experiment is that to mainly avoid the accidents on the roads and to control the speed of the vehicle is the main aim of the paper .

The proposed system basically serves two purposes; it automatically detects the potholes and speed breakers and sends the information regarding this to the vehicles, so that they can avoid accidents. This is a cost efficient solution for detection of humps and speed breakers. 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 speed breakers 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. The proposed system can be further improved to display alerts such as 'Bad road ahead' in order to help the driver be more alert while driving/riding on such roads.

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