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Road Condition Improvement in Smart Cities Using IoT

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Abstract - *According to Recent studies it has shown that road surface monitoring is essential for Municipal Corporation as they have to do surveys for road maintenance in order to provide better services and to reduce road accidents ,which eventually requires lot of time and money investments.*

Moreover the proposed system provides the efficient survey regarding various possible streets under the particular Municipal Corporation which basically leads to the growth as well as nurturing of the potholes.

Thus, the Municipal Corporation is frequently handed over with recent upgraded survey information. In this approach , a database is maintained for each road which is made available to the Municipal Corporation with the help of global database or through a portal. Potholes detected along with their severity using ***Ultrasonic Sensor*** *and* ***GPS*** *indications. The* ***IoT*** *device automatically updates the status of the road with location information in the database .*

Key Words*: Ultrasonic Sensor ,GPS, IoT.*

1. INTRODUCTION

Road Condition Improvement in Smart Cities Using IoT is an attempt towards solving the modern day issues related to potholes and road safety. Road surface monitoring is essential for municipal corporations for quick detection and maintenance of potholes, detecting the other abnormalities of the road such as speed breaker rail road crossing etc. and making them accessible to the travelers will provide a better driving experience. If such information of all roads is put on a central server which could be accessed by anyone freely, the drivers can choose the best possible road from source to destination. The bad road condition is the main reason for all the truck accidents, according to the survey in The weakened road system increases the maintenance cost and the negative effects on the axle and suspension system of the vehicles.

2. LITERATURE SURVEY

A. Pothole Detection System Based on Image Processing technique

Pothole detection involves different processing methods such as image filtering, image segmentation and clustering techniques like edge detection, K-Means and Fuzzy C-Means. The result where evaluated based on the traditional performance measures - accuracy, sensitivity, specificity and computational time.

Grayscale Conversion: The next step required for pre-processing is to convert RGB-image (original pothole image) into grayscale image using standard techniques to restrict the images to a single plane before image segmentation process

Median-Filtering : The Median filter was used to remove random noise in grayscale image and give a smoothed output image. Also median filter maintains the integrity of image regions and boundaries.

B. Pothole and Speed Breaker Detection using Android Device

This System present a vibration based approach for automatic potholes detection along with their co-ordinates. In this approach, a database is maintained for each road, which is made accessible to the public with the help of global database or through a portal. Potholes are detected with their severity using the in-built accelerometer.

Methodology:

Primarily, the 3-axis acceleration data was collected from the built-in accelerometer of an android device and applied a continuous monitoring of z-axis acceleration. When any pothole or a road breaker is present it results into sudden changes in the acceleration along z-axis, which is compared against *zth* and appropriately classified into different categories. The road abnormalities in this paper are classified into two categories *viz* potholes and speed breaker as given in Table I. Severity is calculated on a scale of 1 to 3. 1 refers a normal severity, 2 to high severity and 3 refers to very high severity

This algorithm would mainly focus on following two aspects:

i. Real time detection of potholes and speed breakers along with their location coordinates.

ii. Severity of Potholes as well as speed breakers on the scale of 3.

C. Use of Stereo Vision in detection and counting of potholes

This system contains two USB cameras taking photo simultaneously. We use parameters obtained from camera calibration with checkerboard to calculate the disparity map. 2-dimensional image points can be projected to 3-

dimensional world points using the disparity map. With all the 3-dimensional points, we use the bi-square weighted robust least-squares approximation for road surface fitting. All points below the road surface model can be detected as pothole region. The size and depth of each pothole can be obtained as well. The experiments we conducted show robust detection of potholes in different road and light conditions.

To remove the limitations of the above approaches, we propose a detection method based on computer stereo vision, which provides 3-dimensional measurements. Therefore, the geometric features of potholes can be determined easily based on computer vision techniques. The proposed method requires two cameras to take photos simultaneously. Compared with the expensive high-speed 3D transverse scanning equipment, USB cameras are affordable and flexible. The geometric information of road potholes can be obtained by the stereo camera.

Methodology:

In this section, we introduce the proposed road pothole detection system.

1. Stereo camera parameters, including intrinsic parameters and extrinsic parameters, are obtained using a checkerboard based on Zhang's camera calibration method. The on-line flowchart of the proposed system. There are 3 main modules: Image processing, disparity calculation and pothole detection. Before transferring the image coordinates to the world coordinates, some preparation work needs to be done.

2. The proposed system consists of 2 modules: Off-line processing and on-line processing.

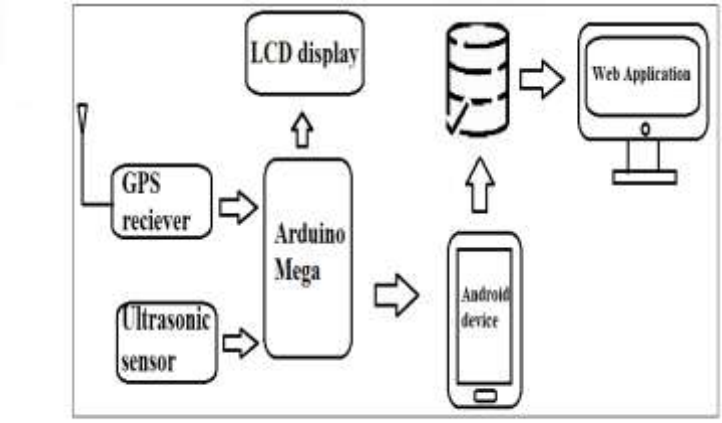
D. Road Conditions Improvement in Smart Cities using IoT

In order to maintain the roads and to reduce road accident also to provide better services to people our proposed system will identify the speed breakers and potholes present in the path. In our system, an internet of things based road monitoring system is proposed to identify the potholes and in the road.

There are various tools and techniques that has already developed for the potholes and speed breaker detection by various researchers. Various systems and solutions proposed regarding the problems of many streets lands-up to the detection of numerous spotted potholes on various different streets of particular area under the Municipal Corporation.

The Municipal Corporation is frequently handed over with recent upgraded survey information. In this approach , a database is maintained for each road , which is made available to the Municipal Corporation with the help of a portal. Potholes are detected along with their depth and GPS indications.. The system automatically updates the status of the road with location information in the server . Certain undeveloped roads might be few miles along the roads under Municipal Corporation , remain untreated which is the most hectic problem for the rural people for their daily transportation.

Methodology:



SYSTEM ARCHITECTURE

The proposed road surface monitoring system consists of :

1) At initial stage the Ultrasonic sensor will capture the depth of the potholes.

2) The captured entries of potholes will be categorized according to their severity levels such as low, moderate, high.

3) As soon as the pothole is detected, the android application notifies the user. Thereafter, the user has a choice to accept or deny the notification.

4) The latitude and longitude of that location is fetched by the GPS sensor and stored in database.

5) The Municipal Corporation authorities has the privileges to access the database.

6) Admin passes on the request of all potholes entries to the contractor based on the severity level of the detected pothole.

7) Contractor will accept the request, and treat the potholes. Once the potholes has been repaired, the contractor removes the particular request entry from the request list..

8) Eventually the particular entry will automatically deleted from the entire database.

3. CONCLUSIONS

An IoT based road abnormality monitoring and the status sharing is proposed in this paper. Here we have tried to evaluate the feasibility, effectiveness, and usability of survey based system which in an attempt to determine the appropriate requirements for a full- scale application development.

It even symbolizes the effective reduction in the manual work to be done by the government authorities. Moreover, a fulfillment factor has been accurately introduced in the system based on Ultrasonic sensor and GPS devices, which will successfully handover the recent surveyed data to the respective government authorities in order to frequently repair the potholes leading to the pothole free streets, hence the good percentage of accidents can be reduced.

REFERENCES

1. Buza , E.; Omanovic , S.; Huseinovic , A. Pothole Detection with Image Processing and Spectral Clustering. 2nd International Conference on Information Technology and Computer Networks (ITCN '13), Antalya,Turkey. 2013; pp.

2. Seung-ki Ryu,Taehyeong Kim and Young-Ro Kim, "Image-Based Pothole Detection System for ITS Service and Road Management System,"Hindawi Publishing Corporation, Mathematical Problems in Engineering, Article ID 968361, Volume 2015.

3. Vijaya Bashkar. A, Gowri Manohar. T, "Surface Pothole Depth Estimation Using Stereo Mode of Image Processing," International Journal for Advance Researchin Engineeringand Technology, Volume 4, Issue I, Jan. 2016, pp. 42-46.

4. "Potholes are a Top Cause of Auto Accidents," Law Offices of Michael Pines, APC. [Online]. Available:https://seriousaccidents.com/legaladvice/top-causes-of-car-accidents/potholes/. [Accessed: 02-May-2018].