Pothole Detection System

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Abstract: Our project is related to detect the pothole. It is a constructive failure in a road surface, usually asphalt pavement, due to water in the underlying soil structure and traffic passing over the affected area.as a direct result serious road accident can occure because of this failure, especially when vehicle speed is faster on that road so we introduce new system which is" pothole detection system" which help the user in avoiding pot-holes on the roads. In this system first of all we get the videos from the camera then we convert the images from some videos and give the annotation to potholes in each images, which give the idea how the potholes look like then we train the model and testing the object in which we run the any video and make the different frame from that video that is store in the database and detect the potholes from the frame according to the trained model which display the total number of detected potholes on thedashboard.

Keywords: – Potholes, detection, Smart City

I INTRODUCTION:

Our project title is the Intelligent Smart City Surveillance but there are many projects include in Intelligent Smart City Surveillance like automated number plate recognition, Speed Detection, Wrong-Way vehicle movement detection , traffic management etc but our project include in Intelligent Smart City surveillance is "Pothole Detection System". The potholes create the bad condition on the road especially in monsoon potholes are occure much more because of poor road .so avoiding this potholes we introduce "Pothole Detection System" which detect the potholes on the road of the particular area and display the total number of the detected potholes on the user dashboard. So user knows how much potholes on which road of the particular area and user can alert about that road as well as this count of detected pothole is published to all the users so user can complain to government to take the action immediately for potholes so it also avoid the corruption because the count is openly displayed of the particular area on the all user dashboard.

1.1 PURPOSE:

Poor road condition damage to the vehicles and occure the serious road accident, Although we complain about the bad road but there is no way to detect or report them at scale. To avoid this issue we develop a system to detect potholes and display the count of detected potholes on the userdashboard.

1.2 PRODUCTSCOPE:

- System consists of three parts: Hardware, Software and DataAnalysis.
- Hardware includes cameras, Take the data from thecamera.
- Data Analysis helps converting data into usableinformation.
- Software detects potholes using data analysis results and locate them to theserver.

II LITRATURESURVEY

Pothole detection system which notify the driver to avoiding the pothole on the road by giving the warning. This pothole detection system idea is to alert the driver if pothole is detect on the way to reduce the speed of the vehicle or choose another path, to detect the pothole distance from driver which driving the vehicle,. This detecting system based on image processing It is developed to process and analysis the dataset captured using the camera fix in the vehicle. It gives high efficiency and accuracy compared to the conventional method of the pothole detection on the road[5].

Pothole detection system is mobile application of sensing detect the pothole on the road. To monitor the pothole conditions on the road this system is associated algorithm. This system is called smart city by pothole detection. Pothole detection using accelerometer sensor of android smartphone for detect the pothole using GPS for plotting the location of pothole[6].

We are able to identify the potholes from accelerometer data if pothole detect using machine learning approach. This real-time detection system is the pothole detection system . Assume threshold values of x-axis and z-axis while designing the pothole detection algorithm. Using a neural network technique This threshold values are justified. To get the output This pothole detection system fix in the two, three and four wheelers [6].

Pothole detection system monitoring the road surface. It include automated pothole and bump detection. Using this system This road surface condition notify both driver and road maintainers. Using this system collected information amount would be enormous in term of sensor sample count and geo graphic area coverage, should be get all the mobile phone user involved in a united data gathering task[7].

A system for pothole detection comprises an input interface configured to receive sensor data and a pothole detector configured to determine a pothole based at least in part on the sensor data using a model, wherein the model is used to classify sensor data; and store pothole data associated with the pothole, wherein the pothole data comprises a pothole video[6][7].

The present invention provides a system and method for sensing and managing pothole locations and pothole characteristics. An additional aspect of the present invention is to provide a system that may acquire, fuse, and analyze pothole sensing data from several sources to identify potholes in need of maintenance or repair. Further, the system may be configured to create and distribute recurring reports of pothole repair data for use by roadway officials[8]

III FLOW OFIMPLEMENTATION

3.1 PROPOSEDTECHNIQUE

In our system admin and user are include. For access this system both admin and user must be register in this system. In our system potholes are detected and display on dashboard. Any type of cameras are capture the video and convert into image using Image processing. Neural network is apply the brain to the system to capture the pothole from collected all photos. When system capture the image then count the pothole and display on dashboard. This detected pothole number can see admin and user. User can complain and give the feedback. Admin can reply this complain and edit the count of pothole when potholes solve. This all data are store on the database.

When our system is start then first of all done the register or login without login does not access this system. Then after search the camera location wise. This camera capture the video and video convert into image. When potholes are appear the use deep learning algorithm on image to identify otherwise image is not recognize. Detected pothole are count and display on the dashboard. And admin and user can see the number ofpothole.

3.2 IMPLEMENTATIONDETAIL

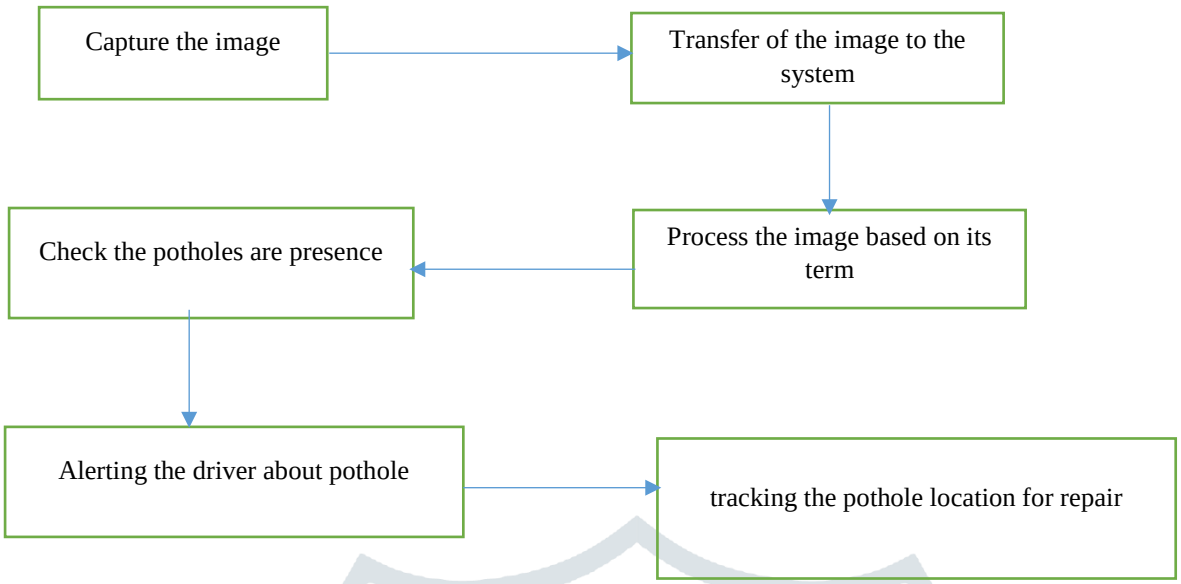

Fig 1. Functional Block Diagram of The Intelligent Pothole Detection System

Implementation of the pothole detection system is capture the video from camera. This captured video convert into the frame using open CV library. This converted frame is one of the image. This is capture image is transmission to the system. This process the image based on its characteristics. This system is conform the pothole in the image. Then alert the driver to slow his vehicle or change his path. This pothole are display on dashboard location wise. Potholes are detect on the particular location using GPSlocation[11].

Fig 2. Detected pothole on road

In runtime stage this pothole detection system, the vector set {x, y, z} can be calculated by adopting the vector set of baseline and rotation angle for accelerometer data normalization.

In Image segmentation to remove the noise from an image completely prewitt is optimum technique and give the exact edge of the pothole. Prewitt operator doest not place any emphasis on pixels which is closer to the center of the mask. This operator measure two components 1.horizontal edge component which is measured as kernel Gx and the virtual edge component which is measured as kernel Gy. Magnitude of Gx and Gy gives the intensity of the gradient in the currentpixel.

Z_1	Z_2	Z_3
Z_4	Z_5	Z_6
Z_7	Z_8	Z_9

-1	-1	-1
0	0	0
1	1	1

-1	0	1
-1	0	1
-1	0	1

The mask for Prewitt Edge Detection Technique isas Gx

=(Z7+Z8+Z9)-(Z1+Z2+Z3)

Gy =(Z3+Z6+Z9)-(Z1+Z4+Z7)

We previously detected the edge of the potholes, To validate the presence of a pothole comparison of plain road image with the captured image is done. For that the following are the Parametric Approaches undertaken:

1. The first approach is Pixel InformationCalculation.
2. The second approach is calculating 1stordermoment.
3. The third approach is calculating 2ndordermoment.
4. Fourth approach is calculating cross-correlation between twoimages.

Fig.5 image of plain road and pothole road

Fig 6 . Functional Flow Chart Of Intelligent Pothole Detection system

Pixel Information Calculation:[7][8] on the plain road image he number of pxels have specific gre level in the dataset and calculated the pixel from capture image on the road .The potholes are determined based on the thresoldvalure present.

1stOrder Moment: In this system 1storder moment of the image on the road are consider and calculated and 1storder momentis the plain road image . The driver given the message to reduce the speed of his vehicle if the value of 1storder moment of the road is less then this image of road isconsider

2ndOrder Moment: In this system 1storder moment of the image on the road are consider and calculated and 2ndorder moment is the plain road image and. The driver given the message to reduce the speed of his vehicle, if the value of 2ndorder moment of the road is less then this image of road isconsider,

The central moments of third order are given by the equation 2.1 as:

$$M_{00}= \sum_x\sum(x,\ y)\ M_{10}= \sum_x\sum_y xf(x,\quad y)\quad M_{01}= \sum_x\sum_y yf(x,\quad y)\quad M_{11}= \sum_x\sum_y xyf(x,y)$$

$$M_{20}= \sum_x\sum_y x2(x,y)$$

$$M_{02}= \sum_x\sum_y y2(x,\ y)$$

$$\mu_{11} = M_{11} - \frac{M10M01}{M00}$$

$$\mu_{20=} M_{20} - \frac{M10}{M00}$$

$$\mu_{11} = M_{02} - \frac{M01}{M00} \qquad (2.1)$$

Where f(x,y) is the intensity value at (x,y) coordinates of the image.

Cross-Correlation: between binary plain image and the captured image of the road database the value is carried. If value of cross-correlation is higher than threshold, means that pothole on the road.

The cros-correlation of two real continuous functions,

ϕ_{xy}given by the equation 2.2 as:

$$\phi_{xy}(t) = \int x(\tau - t)\ y(\tau)dt$$

In the discrete domain, the correlation of two real time series

$x_{i,i}$= 0, 1, …, M-1 and

$y_{j,j}$= 0, 1, …, N-1

is given in equation 2.3 as:

$$\phi_{xy,k}= \sum_{j=(0,k)}^{\min(M-1+k,N-1)} xy,\ k = -(M+1), \dots .,0, \dots ., (N-1)$$

IV TOOLS AND TECHNOLOGYUSED

Programming Languages: J2EE, Python

SDKs: Dialog Flow

Framework: Spring Boot.

Tools: Eclipse IDE, pycharm, SQLYog.

V CONCLUSION

We have described a problem that currently exist with potholes and the issues they pose, as well as presented a solution in the forum of comprehensive pothole detection. We believe that this system could be great asset to both motorists and city official for quickly detection and reporting potholes.

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