ABSTRACT

Roads are viewed as the fundamental method of transportation. Nonetheless, because of the substantial gridlock, these roads require framework upkeep. Frequently this support isn't done on the grounds that it is difficult to control anyplace or on account of obliviousness. This prompts a pothole, which leads to and fro and causes a great deal of mishaps. This paper examined how to recognize potholes with the assistance of a camera mounted on a light strip. The picture handling strategy utilized, was informed to BMC authorities without really wasting any time utilizing an electronic framework to diminish difficult work. To test its presentation, the gave framework was carried out in Windows utilizing a CV library. To recognize potholes, straightforward picture handling innovation is utilized, for example, form discovery and Hough changes.

Keywords-Pothole, Open CV, Python, image processing

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CHAPTER 1

INTRODUCTION

1.1 Pothole Detection

Potholes are the biggest problem facing by the people who regularly moves from one place to another for their work purposes or for other reasons using vehicles through roads. Considering the present situation caused by covid-19 the governments are facing challenges to continuously monitor the roads, so it causes the pot holes to go not notified and leads to many accidents. Many analysts regularly use understanding and strolling strategies to recognize potholes. Recognizing and counting potholes utilizing diverse drawing strategies can help separate between various kinds of ways. potholes acknowledgment incorporates an assortment of handling strategies like distinguishing proof, supernatural, picture channels, picture disengagement, and mix techniques like K-Means and Fuzzy C-Means.

In the present technology driven world, the detection of pot holes can be done using many techniques. Few of them are Image processing techniques like considering thresh hold values [2] for the potholes and processing through some steps to detect and Blob analysis[7] also used for detection, where the pot holes ae detected by considering the color of the image and there are some more techniques in image processing like edge detection[9] and considering discolorations[1].Some other methods for finding the pot holes are by using various machine learning algorithm like the SVM[6] and the same can be done by using deep learning algorithms like using CNN , YOLO[11] etc. Some papers showed the use of accelerometer [3], sensors for the detection.

Image processing is a technique which is used to get any useful information if present in the given image. There are various stages in this image processing from enhancement, extracting the shape [13] to image segmentation [10] and detection or recognition. a video footage is taken from an online source of a road containing multiple potholes in it. And then applied image processing techniques using Open CV, in which the video was gone from one stage to another to finally detect whether there are potholes present in the video footage that was taken. The video taken has gone through some techniques used in image processing [12].

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1.2 Image Processing:

Image processing is the process of transforming an image into a digital form and performing certain operations to get some useful information from it. The image processing system usually treats all images as 2D signals when applying certain predetermined signal processing methods.

There are five main types of image processing:

Visualization - Find objects that are not visible in the image

Recognition - Distinguish or detect objects in the image

Sharpening and restoration - Create an enhanced image from the original image

Pattern recognition - Measure the various patterns around the objects in the image

Retrieval - Browse and search images from a large database of digital images that are similar to the original image

CHAPTER 2

LITERATURE SURVEY

SungWon Lee et al. [1] have implemented a model for detecting pothole by considering the discolorations present in image. It is the image processing method, it shows textures in the image by using a wavelet energy field. The major disadvantage of this model is there can be many discolorations in an image, where every discoloration is not a pothole.

Lokeshwor H et al. [2] have implemented a model for detection of potholes, cracks using the values of threshold which were defined earlier. The detection was done with help of some image processing techniques. The main problem for the system is of the prejudged threshold values because for different potholes or cracks the values will be different.

Sunil Sharma et al. [3] implemented a model based on accelerometer for potholes detection. In this work they had used Machine learning algorithms, which they put in the data collected by accelerometer pothole detection. The setback of this model is not only potholes, other obstacles also recognized as potholes.

Danti et al. [4] proposed a model in which image processing algorithms are used for detection. The model is implemented to detect road signs, lanes and potholes. This system didn't depend on any neural network to detect a pothole. The drawback of the model is detection of unwanted areas by the algorithm.

Karuppuswamy et al. [5] proposed a model by assuming that every pothole as a circular object and diameter of 2 feet. For detecting the pothole, they used a standard imaging board. For calculating the image threshold that was necessary for detecting the pothole they used image histogram. But they didn't provide any practical proof and it can't be applicable to real world.

Nhat-Duc Hoang [6] proposed a model to pothole detection on machine learning. The algorithm used in this model is Least Square Support Vector Machine. The main set back is it can only predict only certain type of potholes and it requires more time for training the data set.

D ewiani et al. [7] implemented blob detection technique to detect potholes present in the images. This technique in a presented in their research paper might not detect the potholes proper way because of the nature of the technique.

P.Yuvaraj et al.[8] came forward with a setup by using raspberry pi ,image processing to detect the color of the image and developed a mobile application to get notification to the drivers on the presence of the potholes.

Syed Mohammad Abid et al. [9] provided an overview on edge detection and other morphological operations by applying on some images. The main issue of this work was not able to specify the correctness of the methods used.

Dilpreet Kaur [10] paper mainly points various image segmentation techniques for image classification. The main method of our work was taken from this paper as a reference.

E.N. Ukhwah et al. [11] implemented a system in which they used YOLOv3 for the detection of potholes. They took the images from the

camera that was fixed on a survey vehicle. The drawback of their proposed work is there are next versions of the YOLO algorithms which produce better accurate results than the algorithm they used.

Nienaber et al. [12] implemented a system to detect the potholes by taking the image of a road. They applied canny edge detection to detect the edges and convex hull algorithm for the noise removal. They tested this model by attaching the camera to a vehicle which was moving at the speed of 40km/h. The drawback of this system is it faces challenges to detect the potholes which didn't have visible edges.

Chen H et al. [13] provided another method for pothole detection. They collected the data from passenger vehicles. For the extraction of shape, they used spectral clustering which adds Otsu which is a image thresholding for automatically finding the values of threshold.

Pawade et al. [14] presented a model for detecting potholes by using Field programmable Gate Arrays (FPGA). In this model they used three edge detection techniques named canny, Sobel and prewitt. These three techniques are processed by FPGA parallelly. The drawback of this model is it is hard to detect the potholes in real-time.

Koch and Ioannis[15] presented a method to identify the potholes. They used an algorithm that contains three phases named image segmentation, shape and texture extraction. The drawback is it was inefficient for computation because of the detection of potholes repeatedly in an image.

Balasubramanian,[16] presented Convolutional neural networks are very effective in identifying objects, and hence, this approach has been adopted for Potholes Detection on Roads, In Computational Vision and Bio-Inspired Computing