International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 03 | March - 2021 ISSN: 2582-3930

POTHOLE DETECTION AND REPORTING SYSTEM

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Detection of a pothole is an important function of avoiding road accidents. Today, road pressures are hand-picked, requiring time and effort. In this system, we will be using advanced Deep learning algorithms to find holes in real-time. Using in-depth learning method we will create a CNN model, train it by providing a pothole dataset in it and then see if the citizen-provided image is valid and then PWD (Department of Public Works) can take the necessary steps in it.

Keywords--- Pothole Detection, Deep Learning, Object Detection,CNN.

I. INTRODUCTION

In recent years there is sharp increase in accident caused due to potholes. Today road maintenance is done by hand which is time-consuming. Therefore, there is a need for a faster and more reliable way of finding potholes that can change the current process and prevent road accidents. Therefore, our main objective is to develop a system that will monitor the pit and reduce the work of the relevant authorities in monitoring the existing pit or not. The idea is to create a dedicated platform where citizens can report, discover, and track pits in a more efficient and user-friendly way. The structure of the system helps to close the gap between the stakeholders involved and thus ensure transparency. Road damage monitoring and reporting systems remain a major problem, as government agencies still strive to maintain accurate and up-to-date sources of such structural damage, making it difficult to stockpile appropriate repair services. The problem is exacerbated as the number of professionals who can assess such damage to a building is limited, and otherwise, the most widely used data collection methods in the field are increasing over time, costly, require minimal technical expertise, and much more submissive and possibly flawed. Therefore, both educational efforts and marketing programs are simplified the process, using a combination of modern technology. Many of these methods include sensors of various types (eg inertial profiles, scanner), but also imaginative methods, which have proven to be suitable for this task. The information collected by these sensors and cameras can be integrated into in-depth learning algorithms to make the testing process work.

II. RELATED WORK

To date a variety of techniques have been used to detect potholes such as sensor-based techniques, pothole detection using thermal imaging, and 3D reconstruction methods. These methods, although simple, require expensive devices, therefore, these methods may not be able to be used on a large scale. There are certain restriction with the techniques used above that are the use of expensive equipment, accuracy depends on brightness, and algorithms used are not optimal

N. Hoang proposed an AI model for pothole detection and used algorithms such as LS-SVM and ANN which gives accuracy of 89% and 86% respectively.

An experiment using sensors and a deep CNN model was proposed for automatic crack detection. In this experiment, annotated images are used as input for the model and the CNN model automatically learn the features without any feature extraction process

Fig. 1. Sample Images From Pothole Dataset

III. PROPOSED METHODOLOGY

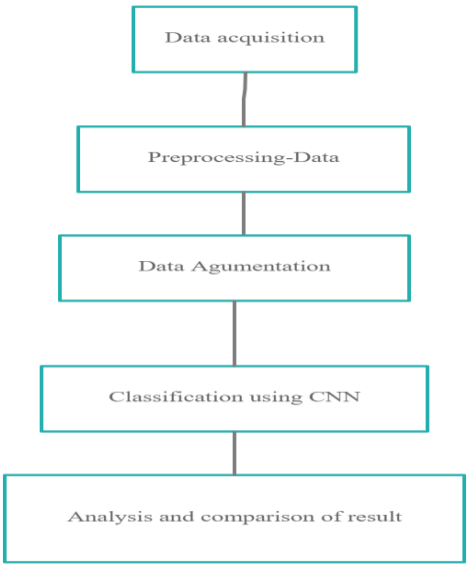

Fig. 2. Pothole Detection Flow Diagram

1. Data acquisition:

In this step many photos of pothole is taken from various angles and all these contribute to a dataset. This dataset contain both potholes and non-potholes images Potholes are identified by considering following factors -:
1)According to potholes size there are Low, high and medium type of potholes
2) According to potholes shallowness there are non-shady and shady type of potholes
3) According to moisture presence there are dry and wet type of potholes

2 Pre-processing of data:

This is one of the most important steps in which we perform the various preprocessing technique on the dataset. The following operations are -

2.1. Capturing of photo:

Photos are captured in such a way that the camera labels do not hinder photo-processing methodologies

2.2. Images resizing:

Images are resized to half before training to avoid a case in which hardware is unable to handle the processed images

3 Augmentation of data:

Data augmentation is a technique that increases the variety of data available for training models, without actually collecting new data. In large neural networks, data augmentation techniques such as cropping, padding, and horizontal flipping are commonly used for the preprocessing of data

3.1. Zooming of image

Zooming means changing the magnification of the image this can be useful when the image is taken far from potholes

3.2. Rotation of the image

The rotation of the image changes the pivot of the image. After rotating the image it seems like a new image is taken from a different angle and this will increase the size of the dataset and that will result in better accuracy

3.3. Mirroring of image

By mirroring the image we are replicating or making multiple copies of the data, will increase the size of the training dataset

3.4. Blurring of image

Edges and corners present in the images are sharp elements, and decreasing the sharpness of sharp elements is known as Image blurring.Blurring image decreases the size of the image which will decrease the size of the dataset and leads to better training of the data model.

3.5. Improvement of comparison

Image contains more intensity when the contrast of the image is increased and thus improves the training of the model

3.6. Salt and pepper noise

Noise form sometimes seen on images of the dataset is known as Salt-and-pepper noise Sharp and sudden disturbances in the image signal can cause this noise. They are sparsely occurring 0 and 1 pixels. A median filter and morphological filter are few techniques for effective noise reductions

4 Image classification using CNN

We can upgrade our model by using CNN technique for this we need to perform various test on dataset using CNN technique . Some of the techniques performed on dataset are as follows

4.1) Using ResNet models:
In this model dataset is divided into training and testing dataset,different ratios of training and testing dataset are considered and separate ResNet models are used for each dataset and their accuracy is compared

4.2) Using CNN model :In this model we mainly focus on increasing the accuracy by reducing the overfitting in the dataset and we reduce the height and width of dataset images as it is easier to built a model when dimensions of image is low

IV. CONCLUSION

Capturing potholes in a time-efficient and the user-friendly way can be beneficial for the development of developing countries and for this purpose we are identifying potholes using deep learning which is far better than current techniques. Using this technique we can find potholes with higher accuracy and this method can be used by any citizen with great ease and the user can track their complaint and check if necessary actions are taken for their complaint. Moreover, this technique will save a lot of time for PWD workers as now they don't have to find potholes manually.

5. REFERENCES

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