Crack And Pothole Detection using YOLO

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***Abstract*— Because of ecological changes and low quality of development materials, breaks might foster in the walls of the structure or potholes might foster out of roads causing heavy damage to the infrastructure. One of the underlying indications of the corruption of a substantial surface or a material is cracks. Manual review of cracks and potholes has numerous downsides since it's tedious and it totally relies on expert's information and experience. For the crack and pothole detection and analysis the following model uses Convolutional Neural Network (CNN) in substitution for manual approach. The You Only Look Once (YOLO) algorithm overcomes the drawbacks of manual inspection and other image processing techniques. The algorithm is projected to give real time detection of potholes which will help authorities to identify the damage and fix it before the condition worsens.**

***Index Terms*—Keywords— CNN, YOLO.**

I. INTRODUCTION

In this model we are going to deal with the problems present in the surfaces which are related to the cracks and pothole detection using CNN model that automatically detects and analyses cracks and potholes on a surface real time. The proposed model automatically recognize crack pixels and gives us the idea that the highlighted area is been cracked. If such task is been performed by the human in such case it will take more time as compared to the machine. There are different techniques present which can help us to get the desired output but YOLO algorithm allows real time detection which is a step up over conventional image processing techniques. The assignment of crack and pothole recognition particularly in developing nations, is frequently done physically. Subsequently, additional time and exertion is expected to acquire the estimations of breaks and to arrange or deal with important information. Also, manual visual examination is wasteful as far as both expense and precision since it includes the abstract decisions of overseers. In the recent reviews done has pointed out an increasing trend of applying CNN for boosting the productivity of detecting cracks in structures.

II. PROBLEM STAEMENT

To provide a deep learning model to detect crack and potholes in surfaces such as "Walls" and "Roads" using convolutional neural network and YOLO. This model is real time, time efficient and highly accurate in detecting cracks and potholes using a camera (inbuilt webcam or peripheral).

III. LITERATURE REVIEW

A. Survey Existing Systems

1) Image based concrete crack detection using convolutional neural network and exhaustive search technique: Researchers have proposed a model that recognizes cracks on concrete surfaces using CNN. It follows an exhaustive search technique for image matching.

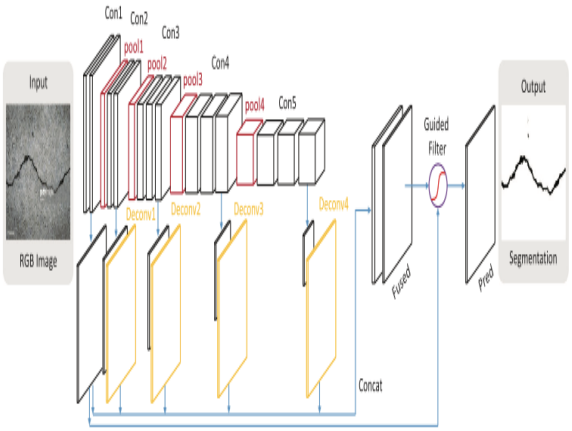
2) Crack detection using image processing: A method for detecting cracks from a two dimensional image has been proposed by researchers. Cracks in different type of structures can be detected by applying image processing techniques on a two dimensional image. It provides an automated method for inspection of cracks which can cause damage to infrastructure.

3) *Image-based pothole detection system for ITS service and road management system:* Researchers proposed an algorithm for pothole detection using two dimensional images. It uses vehicle stationary optics which will provide a pothole alert. The system is applied to Intelligent Transport System service.

4) Detection and counting of pothole using image processing techniques: Researchers have proposed an image processing based method for pothole detection. Gaussian-Filtering along with clustering based

segmentation are applied in this method. K-Means clustering based segmentation was applied for faster computation results.

B. Proposed System



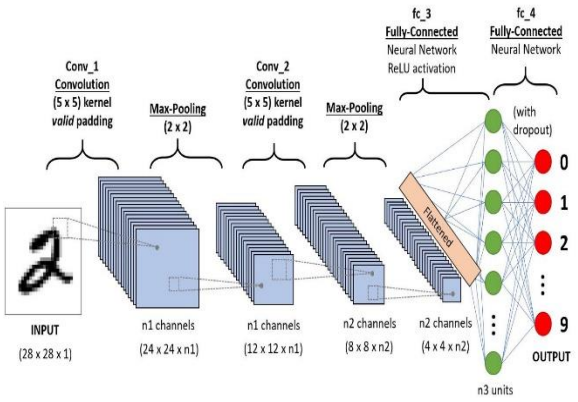
—Fig 1: Architecture of CNN

The project model is based on Convolutional Neural Network architecture. In this model the image is treated as a binary image. It uses different layers to learn various features of an image. To alleviate the imbalanced distribution of data a specially designed loss function is used. In this there are far more negative pixels than positive pixels. DSN is applied to provide feature learning at every convolutional stage. The dataset consists of different types of cracks and pothole features. YOLO is applied for detection object in real time.

IV. Algorithms

A. CNN

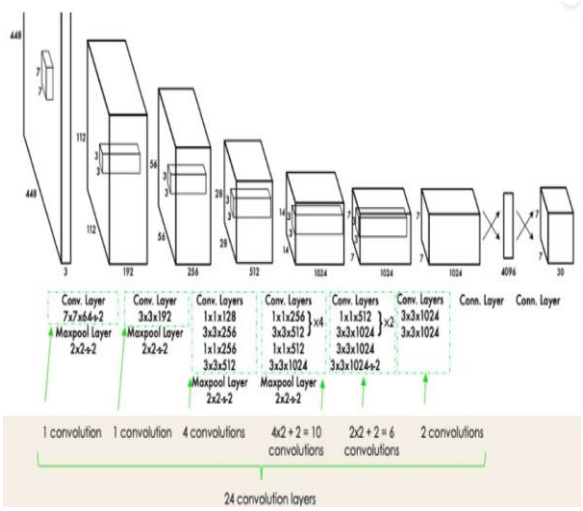
CNN or Convolutional Neural Network is a network architecture based on deep learning which can take an image as an input and is able to differentiate among the objects in an image. It assigns weights and biases to the objects in the image. CNN is able to directly learn from the given data. The CNN network architecture is similar to Human Neuron network in the brain. CNN comprises of many layers each of which can highlight various features in an image.



—Fig 2: Convolutional Neural Network

B. YOLO

YOLO is a deep learning algorithm which is used for detection of objects in real time. It makes use of videos, images and live feed to detect objects .Convolutional Neural Network learns features from the frame which are then used by YOLO for the purpose of object detection. YOLO is a concept of CNN for performing detection of objects in real time. YOLO is highly efficient and accurate compared to other techniques.



—Fig 3: YOLO Network Architecture

V. METHODOLOGY

We start with downloading the models which will download yolo.weights file containing a pre-trained network weights. Then we initialize the parameters. The YOLO algorithm generates bounding boxes as the

prediction detected outputs. After which loading of classes and model is done. Now we read the input which can be an image or video stream using your webcam. So we provide a real time image of a surface or video stream of a surface to check the presence of a pothole in it. After which processing of each frame is done. The input image is converted into blob format. We find the names of output layers from the image. Then after post-processing of the networks output, the predicted boxes are drawn which detect the potholes or crack on a surface.

VI. RESULT

—Fig 4: Pothole detection- Image1

—Fig 5: Pothole detection- Image2

—Fig 6: Pothole detection- Image3

VII. CONCLUSION

In this paper we conclude that the proposed CNN model will provide real time detection of cracks and potholes using YOLO algorithm. This model will provide faster, efficient and more accurate results than the image processing techniques.

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