MJRET

OPEN ACCESS

Multidisciplinary Journal of Research in Engineering and Technology

www.mjret.in

eISSN:2348-6953

Plant Disease Identification Using Image Processing

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***Abstract* :** *India is among top exporters of grapes. But due to the infected plant, quality and quantity of grapes is decreases. So early and accurate detection of disease is important to eliminate future loss. The project focuses on the approach based on image processing using machine learning for identification of plant diseases. In this paper, we would propose an web and android application that helps farmers for identifying plant diseases by uploading a leaf image of their to the system. The system uses a convolutional neural network algorithms which can identify the type of disease. The input image given by the user to the system undergoes various processing steps to detect the disease and results are returned back to the user via web or android application. It will also suggest the precautions and cures for the plant. We are also providing corresponding pesticide and nearby pesticide retailer.*

Keywords: *Image processing, CNN, OpenCV, Detection, Identification of plant leaf disease.*

1. INTRODUCTION

With the evolutions observed in various living organisms, the technologies are also continually improving and taking different forms. Regardless of these extreme advancements, the basis of survival for every human being is agriculture and crop production since time immemorial. Due to the tremendous increase in population, the demand for a higher crop production is observed. Although the quantity has been increased in various ways, the deal with major loss of crops is still a nightmare for all the farm workers. The disease in plants contribute to a huge loss in the production rate, thus making drastic economic loss, ultimately lessening the quality needed for leading a healthy life. One solution to eradicate such loss is to identify the diseases in an early stage and take necessary precautions.

The traditional method for detecting plant disease is through naked eye observation by the field experts. This method requires a lot of time, and is not feasible for the entire field to be monitored properly. Moreover, this is cost consuming and can be inaccurate for minute symptoms. Taking the advantage of mobile phones and computers' usage along with the improvements in the field of image processing, the identification of plant diseases can be made easy and accurate. The methodology presented in this paper pertains to the most common diseases found in grape plant like Black rot, Esca and leaf blight.

The images that are digitally caught would be processed through an algorithm for the determination of affected leaf area. The proposed methodology consists of major steps as image acquisition, pre-processing, segmentation, feature extraction and classification. The output generated from classification can finally determine the disease. This paper not only aims to identify the disease, but also provide the pesticide suggestion for that particular disease. In addition to that, the list of suppliers from where one can get these pesticides would also be provided.

2. RELATED WORK

In the paper [1] the diseases detected are Alternaria Alternata, Bacterial Blight, Antracnnose, Cercospora leaf spot. The methodology used is image processing technique which uses k-means clustering algorithm which is implemented in MATLAB.

In the paper [2] it recognizes illness and prompts the treatment for the affected plants. They have used dataset of 5000 pictures of unhealthy and solid plants, where convolutional system and semi-supervised techniques are used to characterize crop species and detect the sickness status of four distinct classes.

In paper [3] an enhanced k-mean clustering algorithm to predict the infected area of the leaves. The color-based segmentation model is defined to segment the infected region and placing it to its relevant classes. Experimental analysis were done on sample images in terms of time complexity and the area of infected region. Otsu classifier and k-means clustering algorithm is used in this paper. Disease detection contains steps like image acquisition, pre-processing, image segmentation, feature extraction and classification. Alternaria Alternata and Bacterial Blight diseases detected in this paper.

In paper [4] they have proposed an efficient smart mobile application model based on deep CNN to recognize tomato leaf diseases. It can recognize the ten most common types of tomato leaf disease. To build the app they have taken the inspiration from MobileNet CNN model.

In paper [5] they aim to propose a robot that can detect diseased leaves among normal leaves. A smart phone camera is fixed on the robot which streams live videos to the laptop for performing image processing and for data navigation Arduino-uno is used. The technique used is Convolutional Neural Network.

3. METHOD

The disease like black rot dominantly attacks the green part of the vines in a grape plant. It is a fungal disease like that of esca. The symptoms of leaf blight appear as minute water soaked spots on the lower surface of leaves. These features are needed to be considered for identifying the disease. With the help of OpenCV, a machine learning software library, various algorithms can be implemented for the processing of image to get an extract.

Deep neural networks have been applied in many varied domains giving lofty success rate. Neural networks provide a mapping between an input to an output, i.e., diseased plant image to a crop-disease pair. The nodes comprised by a neural network works as mathematical functions taking numerical inputs from the arriving edges, and administer a numerical output as an outgoing edge. Deep neural networks are simply mapping the input layer to the output layer over a series of stacked layers of nodes in a way that both the structure of the network as well as the functions (nodes) and edge weights accurately map the input to the output.

Deep learning has been perfected with one particular algorithm named Convolutional Neural Network as it requires a lower preprocessing. The role is to make an image easier to process by reducing it in such a way that it does affect the critical features. The convolution layers might have a normalization layer and a pooling layer exactly after them, and every layer in the network customarily have ReLu non-linear activation units associated with them.

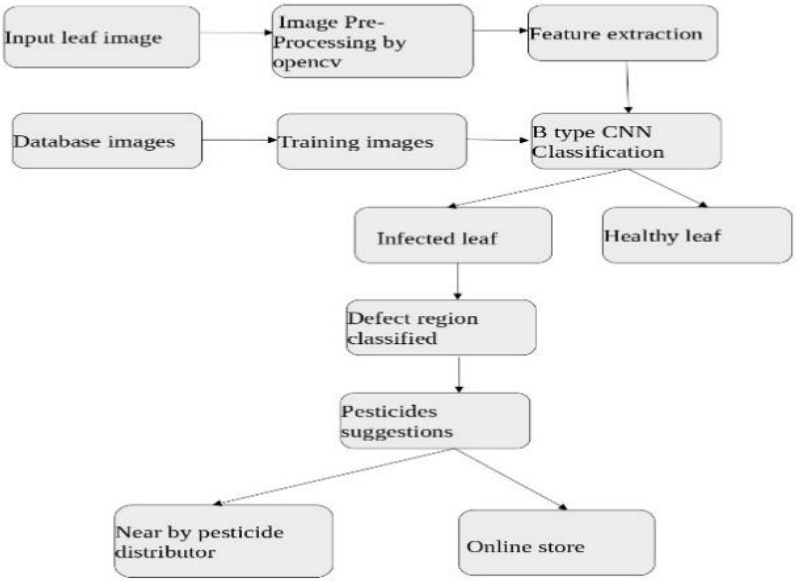

Fig. 1. Proposed System

***Dataset*:**

We are going to use the grape leaf images for the database. This database will be used to train the system. For which some images of normal leaves and some images of defected leaves would be required. The more images we use to train the system the more accuracy is achieved.

- **Hardware resources required**

  1. CPU speed 2GHz

  2. RAM 3GB

- **Software resources required**

  Platform:

  1. Operating System: Windows/Linux

  2. IDE: Python ide.

  3. Programming Language: Python

- **Functional Requirements:**

  1.System Feature 1- Input image from camera

2.System Feature 2- Image processing using OpenCV

3.System Feature 3- Image classification using ML

4.System Feature 4- Pesticides link for buying

- **Non Functional Requirements:**

Performance Requirements

1.Train to machine by database of leaf images.

2.Camera interfacing with python.

Pre-processing:

Image pre-processing is done using OpenCV

Sub-tasks could be categorized as :

- **Image acquisition, storage, transmission**: digitization/quantization, compression, encoding/decoding.
- **Image Enhancement and Restoration**: for improvement of pictorial information.
- **Information Extraction**: for further computer analysis .

4. RESULT

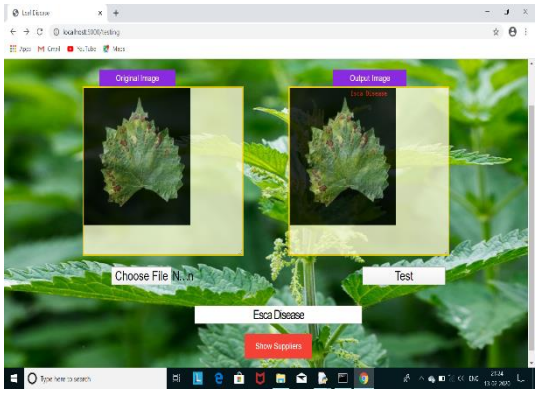

Fig. 2. Disease detection web page

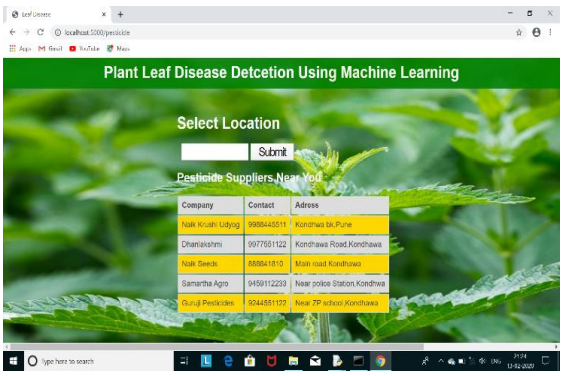

Fig. 3. Online list of pesticide suppliers

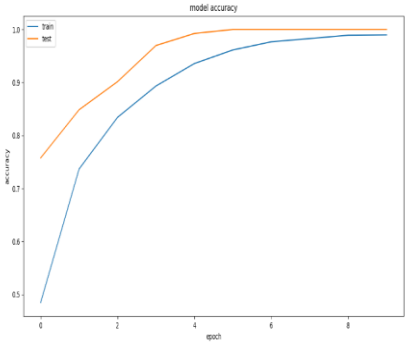

Fig. 4. Accuracy of proposed system

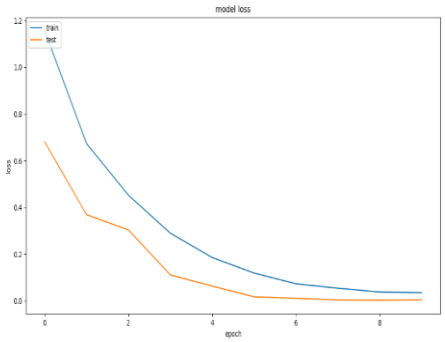

Fig. 5. Loss

5. CONCLUSION & FUTURE SCOPE

This paper deals with the application of Convolution Neural Network for recognizing and classifying the plant diseases by extracting important features required for identification of plant disease. One of the vital applications of image processing is to identify the image which is a vital tool of early disease detection for growth in crop production .This tool will help to lessen the time and cost consumed during manual prediction of the diseases .From the results obtained above we can conclude that Convolution Neural Network (CNN) provides a remarkable accuracy in detecting the diseases .The input image is compared with the trained data for detection and prediction analysis. This work can be further extended to build real time applications which can identify further species of plants instead of just grapes .The given system uses resizing, Gaussian filtering for image preprocessing to segment the leaf area, then finally CNN classification technique is used to detect the type of leaf disease. Thus from the results, it concludes that the system provides reliable results.

In the future, the proposed methodology can be integrated with other yet to be developed, methods for disease identification and classification using color and texture analysis to develop an expert system for early plant disease warning and administration, where the disease type can be identified by color and texture analysis and the severity level estimation by our proposed method since it is disease independent. The performance of the system can be improved in the future by using advanced background separation methods to separate the leaf object from a complex background.

ACKNOWLEGEMENT

The exceptional support of our guide, Prof. R. J. Bhardwaj towards this paper and the research behind it, made it possible for us. Her knowledge and exacting attention to detail have been encouraging and kept our work on track.

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