Review on: Plant Leaf Disease Detection Using Image Processing

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ABSTRACT- *India is a global agricultural powerhouse, in Indian agriculture a variety of crops are seen. The major part of Indian economy is based on agricultural products, there are many reasons which affect the quality and quantity of agricultural products, climate change is one of the reasons, which causes disease and which ultimately turn into reduction of quality and quantity of agricultural products. In this paper we have reviewed papers in which the identification and classification of leaf diseases is studied. There are many classification techniques mentioned in this paper for identification and classification of plant leaf disease detection, like CNN, Image Processing, K-Mean Clustering, SVM etc.*

Keywords- *CNN, Disease, Image Processing, K-Mean Clustering, SVM.*

I.   INTRODUCTION

As per the survey of 2018, India stands 2nd in worldwide agricultural production. Agriculture employed more than 50% of the Indian work force and contributed 17–18% to country's GDP.

India ranks first in the world with highest net cropped area followed by US and China, in India different States have taken a variety of crops. Plant diseases are the major contributors to reduce the potential of crop plants and ultimately reduce the production of agriculture products. Annual losses of crop produce in India are estimated at 25% (NAAS, 2008), this indicates importance and need for strengthening of the existing biosecurity system more, so with the advances in agriculture.

Each plant has a different type of disease found, so it takes a lot of effort and expert people to take care of those plants. In many parts of the country farmers don't have proper facilities and even an idea that they contact experts. Also the consultation cost of experts is very high which adds additional economical burden on the farmer. The process of consultation is also time consuming [3]. Therefore it is necessary to develop cost effective technology to monitor the plants, which detect and identify the diseases, insect pests, etc. Once the disease is identified, farmers can take necessary actions and precautions accordingly. As the rapid development of software and hardware technology, the application of image processing in agriculture has been developed [14]. In Image Processing the image of the affected leaf of the plant is processed to identify the disease.

II.   LITERATURE REVIEW

Here, various papers describing detection of various diseases and methods are discussed. Also various implementation methods are studied.

In paper [1], by Kaushik N, Nikhil K G, Sulagna Sarkar, Theauthors implemented leaf disease detection techniques and soil condition monitoring system using CNN. In this paper the digital image processing is integrated with the machine learning concept which is achieved with the help of python to detect soil condition, leaf diseases, temperature and moisture of the soil. CNN classifier is used to classify the images based upon their image characteristics. Author implemented an IOT based sensor to measure temperature and moisture of the soil to make the system effective.

In paper [2],by Faye Mohameth, Chen Bingcai, Kane Amath Sada. In this paper authors implementa deep learning method to identify plant leaf disease, in which 3 deep learning models like VGG16, Google Net, ResNet 50 used to get good accuracy. Using SVM and CNN classifiers features were extracted, results of DL methods VGG16, Google Net, ResNet 50 came out with accuracy 97.82%, 95.3%, 95.38% respectively.

In paper [3], by Mr. Ashish Nage, Prof. V. R. Raut. The authors implemented leaf disease detection and identification based on python by using image processing. They proposed a system which is capable of detecting the disease in the early stage of growth of disease on the crop, which saves the loss and yield.

In paper [4], by Shantanu Kumbhar, Amita Nilawar, Shruti Patil. The authors proposed a system that classifies the leaf image using image classification algorithm CNN. The user takes the images of the leaf and uploads in the system which detects the disease and also suggests to theuser whichpesticides the user has to use as a preventive measure.

In paper [5], by Abirami devaraj, Karunya Rathan. They implemented and studied alternaria alternata, anthracnose, bacterial blight and cercospora leaf spot, which is automatically detected by the image processing using MATLAB, Developing an automatic system for farmers for detection of disease in initial stages of crops.

In paper [6], by Peng Jiang, Yuehan Chen, Bin Liu, Dongjin He. They proposed an apple leaf disease recognition method based on real-time detection using improved CNN classifier in deep learning method. In this paper, they have an image dataset which collected from a laboratory and a real apple field. The dataset contains 90% of diseased leaves images and by Using CNN classifier they recognize and detect the disease having a high accuracy.

In paper [7], by Vishakha Lahu Bansod. In this paper the authorrepresents a system for detection and classification of Rice crop disease based on Image of infected rice plant. In this Article various techniques used in Image Processing operation for feature extraction and segmentation of disease. They used the SVMAlgorithm on infected leaves which detects color, shape, size and texture

In paper [8], by Subhajit Maity, Sujan Sarkar, Avinaba Tapadar, Ayan Dutta, Sanket Biswas, Sayon Nayek, Pritam Saha. The authors have implemented K-Mean Clustering. In this paper, the leafis categorized by texture, color, size and infected area by using image processing Technique. After the segmentation and clustering, the author gets the output as disease name and accuracy is represented in Histogram.

In paper [9],by S.S.Saranya, Nalluri Chandra Kiran, Komma Jyotheeswar Reddy. They proposed a project which increases the growth of farming outputs, their system is using image processing method (SVM) for detecting affected leaves and identifying using edge detection, texture, diseases spots compared with combined Healthy and Unhealthy leaves dataset and it gives the result as Disease name.

In paper [10], by Xihai Zhang, Yue Qiao, Fanfeng Meng, Chengguo Fan, and Mingming Zhang. The authors implemented maize leaf

diseases detection using improved CNN. They also mentioned other classification techniques like SVM etc. They worked on 9 types of maize leaves and for more accuracy they improved deep Convolutional Neural Networks models. Using CNN models, GoogleNet and Cifar10 systems generated high identification accuracy up to 98.9% and 98.8% respectively. This survey shows that it is possible to improve recognition accuracy by increasing the diversity of pooling operations.

In paper [11],by Shalini K J, Hema M D, Kavya J, Meghana B N, Jeevitha M C. The authors objective behind this project is to increase the growth in the yield of the crops, author worked on the three basic reason of disease that are bacteria, fungal and viral. They also tried to increase the accuracy, speed of disease detection, and disease classification using Raspberry pi 3 model B modules, so that the system can send the information to the farmer as soon as possible by GSM module to their cell phones.

In paper [12], by Saradhambal. G, Dhivya R. Latha S, R. Rajesh. The authors implemented an inventive idea to identify the affected crop and give remedial measures to agricultural fields. Theyused the K-Mean Clustering algorithm for analysis and segmentation of infected leaves.

In paper [13], by T. Thamil Azhagi1, K. Swethal, M. Shravani and A .T. Madhavi. The authors implemented a system having a Raspberry Pi module using Image processing to detect the disease. The picture of the leaf is captured through a high megapixel camera module, the captured picture is analyzed in Raspberry Pi zero board using Image processing techniques, which displays the picture of the infected leaf, name of the disease and the preventive measure of it.

In paper [14],by Prof. Swati Pawar, Ms. Shweta Patil, Ms.Tejaswini Patil, Mr.Nasruddin Shaikh. The authors implemented a system which captures the image of the leaf and then uploads it to a dataset of diseases, in which using the Imageprocessing module and SVM classifier the disease is detected. They worked on the 3 basic leaves of the grapeplant. According to these considerations they worked on the project to detect the disease, they also implemented a hardware using microcontroller to inform farmers about the disease so famer can take preventive actions as soon as possible.

In paper [15],by Vijai Singh and A. K.Misra. The authors presented a survey on different classification techniques like SVM, CNN, K-Mean clustering used for detection of plant leaf disease and different algorithms for Image Segmentation of Leaf diseases images that can automatically detect and classify. They tested their algorithm on Banana, Beans, Lemon, Rose jackfruit, etc. Their project helps farmers to detect the disease in the early stages.

III. CONCLUSION

The paper presents the survey on Image Processing, Image Segmentation Technique that we can use as a good Approach, which is useful for detection of various plant leaf diseases, classifying them into the faulty and normal region. K-Mean clustering, CNN, SVM these algorithms are used for segmentation of the faulty region in leaves which is more accurate than the existing methods. This system is used to support the farmers which identifies the diseases at an early stage and supply

Preventive helpful data for its management also helps to increase the Quality and Quantity of agricultural products to get more yield and higher production cost.

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