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Leaf Disease Detection for Plant Using Image Processing

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Abstract

Agriculture gave birth to civilization. Being an agricultural country, India's economy is largely based upon crop production. Agriculture is the backbone of every economy. In a country like India which has ever-increasing demands for food due to the rising population, advances in the agriculture sector are required to meet the need. The agriculture sector needs an enormous up-gradation to survive the changing conditions of the Indian economy. For optimum yield, the crop should be healthy; therefore some highly technical method is required for periodic monitoring of the crop. Crop disease is one of the main factors which indirectly influence the significant reduction of both the quality and quantity of agricultural products. Several sorts of pesticides are available to control diseases and increase production. But finding the foremost current disease, appropriate and effective pesticide to control the infected disease is difficult and expert advice is required which is time-consuming and expensive. The presence of disease on the plant is especially reflected by symptoms on leaves. So, there is a requirement of an automatic, accurate, and fewer expensive Machine Vision System for the detection of diseases from the image and to suggest a correct pesticide as a solution. Detection of disease through some automatic technique is really useful because an oversized work of watching in huge farms of crops is reduced by it and at the terribly early stage itself it detects the symptoms of diseases means that after they appear on plant leaves. This system presents a neural network algorithm for image segmentation technique used for automatic detection still because the classification of plants and survey on completely different diseases classification techniques that may be used for plant leaf disease detection. Image segmentation, which is a really important aspect for malady detection in plant disease, is completed by a victimization genetic algorithm. Deep learning is a hot research topic in pattern recognition and machine learning at present; it can successfully solve these problems in vegetable pathology. In this study, we propose a new sorghum leaf disease detection method based on convolutional neural networks (CNNs) techniques. To improve the detection accuracy of sorghum leaf diseases and reduce the number of network parameters, the Alex Net model based on deep learning is proposed for leaf disease detection.

Keywords— *Image segmentation, Feature Extraction, Alex-Net Algorithms, Image Processing, Convolution Neural Network*

I. INTRODUCTION

Agricultural is the backbone of any country's economy. Many farmers want to adopt modern agriculture but they can't due to the several reasons like lack of awareness about latest technology, high cost of the technology etc. It has been observed many times that plant diseases are difficult to control as its population is varied according to environmental condition. There are different types of

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diseases which exist in the plants like fungal, bacterial, viral etc. It has been found 85% plants are affected by Fungal like organisms. Farmers of developing countries use traditional method which requires more labour work and is more time consuming. It is also possible that manual detection or naked eye observation cannot give fruitful results. It is also observed that many farmers use pesticides to remove the effect of disease without confirming the specific diseases, farmers use pesticides unlimitedly which can affect to plant quality as well as human health. Detection and classifications of plant diseases using image processing techniques and CNN models can help the famer to identify the diseases and they can take necessary action to control it.

II. LITERATURE SURVEY

This system is used to identify the disease in the leaves and notify to the farmers so that they can give the corresponding pesticides to that leaves. It decreases the nearby leaves affection in a short period of time. Using image processing we can easily spot the affected area in the leaves. In reference the normal leaves are taken for the comparison purpose so that we can easily identify the affected leaves. Increase the database the accuracy will be high, images taken for the comparison should not be affected with any of the disease. Various Algorithms are used to detect diseases like ANN Algorithm, CNN Algorithm, Alex-Net Algorithm, SVM classifier and different edge detection techniques like canny edge detection.

The various approaches for detecting the disease in plant Leaf using image processing technique is described in this Section:

Listed here are the relevant papers and research analysis which were involved in the research..

Sr. No.	Title of thePaper	Year of Publication/ Author	Publisher	Methodology	Findings
1	Applying imageprocessingtechnique todetect plant diseases	2012/Anand H.Kulkarni,AshwinPatil R.K.	InternationalJournal of ModernEngineeringResearch	Images are captured usingcamerasaremadeto undergo preprocessingsteps.	Thesystemdevelopedhere is for plant diseasesrecognitionwhichis based on Gabor filter forfeature extraction

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2	AnEffectivealgorithmofedges and veinsdetectionin LeafImages.	2014/ R. Radha, S. Jeyalakshmi	Worldconference on computingandcommunicationtechnologies	Deficiencydetectionisdoneby classificationalgorithm whichclassifiesleafishealthyornot.	This algorithm is basedon the feature extractiontechniqueusingdigitalimage processing
3	MultipleNutrientsDeficiencydetection	2016/MV Latte,SushilaShidnal	Internationalconference onco mmunicationand signal processing	Edges along withveins are detectedbyCannyedgedetection	This algorithm lead to anearlydetectionofdeficiency
4.	SVMclassifierbasedgrapeleafdiseasedetection	2016/ Pranjali B. Padol,Anjali A.Yadav	Conferenceonadvances in signalprocessing	Segmentationforimage processingand image classifier isused.	The proposed work canbeusedtoincreasetheyieldofgrapecultivation

III. PLANT DISEASES AND ITS SYMPTOMS

Following are the some basic information on bacterial, viral, fungal diseases. Bacterial diseases: bacterial diseases named as bacteria causes different kinds of symptoms that include overgrowths of plants, leaf spots, scabs and cankers. Bacterial infection symptoms are nearly about similar like fungal disease. The most common type of symptoms found in bacterial disease is leaf spot. Viral diseases: In the case of viral diseases it is little hard to identify and analyse. Symptoms of viral disease are Mosaic leaf pattern, Crinkled leaves, Yellowed leaves, Plant stunting. Some of the major viral disease.

IV. CONVENTIONAL TECHNIQUES FOR DISEASES DETECTION:

Plant disease detection and classification is process which is consisting of two major parts, Digital Image Processing and machine learning. Image processing includes capture of an images, noise removal, image segmentation, manual feature extraction.

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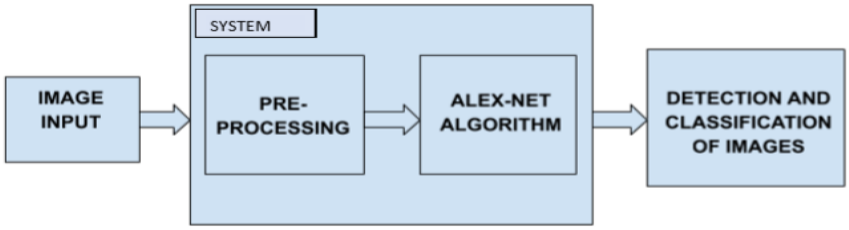

Fig. 1 Convolutional technique for diseases Detection

A. Working

1. RGB to Grayscale conversion of image: A grayscale image is one in which the value of each pixel is a single sample representing only an amount of light, that is, it carries only intensity information. Grayscale images, a kind of black-and-white or gray monochrome, are composed exclusively of shades of gray. The contrast ranges from black at the weakest intensity to white at the strongest.

2. Edge Detection: The Canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images. It was developed by John F. Canny in 1986.

3. Thresholding: Image thresholding is a simple, yet effective, way of partitioning an image into a foreground and background. Thresholding is used to create a binary image from a grayscale image.

4. Noise Reduction: Noise removal algorithm is the process of removing or reducing the noise from the image. The noise removal algorithms reduce or remove the visibility of noise by smoothing the entire image leaving areas near contrast boundaries. Types of noises are salt and pepper, Gaussian noise, Shot noise, etc.

The second stage in processing of image is Alex-Net Algorithm. Alex-Net consists of 5 Convolutional Layers and 3 Fully Connected Layers. Multiple Convolutional Kernels (a.k.a filters) extract interesting features in an image. In a single convolutional layer, there are usually many kernels of the same size. For example, the first Conv Layer of AlexNet contains 96 kernels of size 11x11x3. Note the width and height of the kernel are usually the same and the depth is the same as the number of channels. The first two Convolutional layers are followed by the Overlapping Max Pooling layers that we describe next. The third, fourth and fifth convolutional layers are connected directly. The fifth convolutional layer is followed by an Overlapping Max Pooling layer, the output of which goes into a series of two fully connected layers. The second fully connected layer feeds into a softmax classifier with 1000 class labels. ReLU nonlinearity is applied after all the convolution and fully connected layers.

B. Figures

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Fig. 1 A greyscale image is one in which the value of each pixel is a single sample representing only an amount of light, that is, it carries only intensity information. Grayscale images, a kind of black-and-white or gray monochrome, are composed exclusively of shades of gray. The contrast ranges from black at the weakest intensity to white at the strongest.

Fig. 2. Image segmentation is the most important task in many image processing systems, such as pattern recognition, image retrieval and small surveillance. The result of segmentation is mainly used for image content understanding and visual object recognition through the identification of region of interest. Image segmentation is used to locate objects and boundaries (lines, curves, etc.) in images and assigns a label to every pixel in an image, in a manner that pixels with the same label share certain visual characteristics. Also, the result of image segmentation is a set of regions that collectively cover the entire image, where each pixel in a region is similar with respect to some characteristic or computed property, such as colour, intensity, or texture.

C.Figure Captions

Fig. 1 RGB to GREY scale Conversion

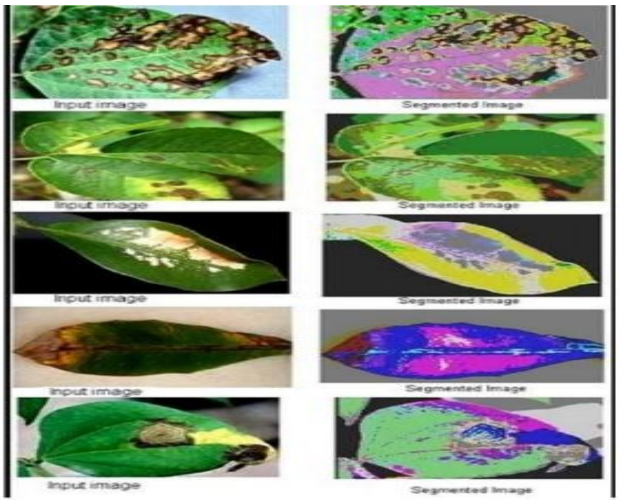

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Fig. 2 Image Segmentation

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C. Links and Bookmarks

[1] https://www.planetnatural.com/pest-problem-solver/plant-disease
[2] https://www.crowdai.org/challenges/plantvillage-disease-classification-challenge

D. References

Examples of reference books of different categories shown in the References section include:

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V. CONCLUSIONS

Sorghum crop diseases can earn tremendous amount of loss in agriculture if sufficient attention is not given. Using computer and communication technologies, an automated system can be built which can provide early notification of disease. ALEX-NETs is a valuable pattern-recognition method both in theory and in application. In this paper, we proposed an innovative technique to enhance the deep learning ability of ALEX- NETs. The proposed ALEX-NETs based model can effectively classify common diseases through images recognition. The application to the Sorghum leaf disease detection shows that the proposed ALEX-NETs model can correctly and effectively recognize Sorghum leaf diseases through image recognition. ALEX-NETs are very good feature extractors.

This means that we can extract useful attributes from an already trained ALEX-NET with its trained weights by feeding your data on each level and tune the ALEX-NET a bit for the specific task. In this study we have implemented techniques of the image processing and machine learning that have been used sorghum leaf disease detection and classification.

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