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ISSN: 0193-4120 Page No. 8539 - 8544

Disease Detection in Plant Leaf using Image Processing

[1]R.Krishna Kumar, [2]B.Akalya,[3]Mohammed Furnoze,[4]K.Praveen Kumar,[5]T.V Preethiksha

[1]Department of Eie, Karpagam College Of Engineering, Coimbatore, Tamilnadu

[2,3,4,5] UgScholars, Department Of Eie, Karpagam College Of Engineering Coimbatore, Tamilnadu

Article Info
Volume 83
Page Number: 8539 - 8544
Publication Issue:
March - April 2020

Abstract

Agriculture plays a vital role in the income of a nation as 16% of the total GDP belongs on it.India supplies a number of agricultural resources like fruits,vegetables,seedsetc to another nation and earn revenue from it.In Agriculture plant disease occurs at leaves,stem,fruitsetc that reduces the quantity and quality of the food which reduces the production .In most of the plants leaves is the foremost thing that gets affected.In order to increase the productivity it is necessary to identify the disease in the early stage .It is difficult for any persons to identify manually.

The identification can be done using deep learning algorithm for achieving greater efficiency and accuracy .The identification can be done using various algorithm such as Convolutional neural network ,K-means Algorithm and SVM Classifier.Many essential research have been done in the field to provide benefits in detecting the symptoms as soon as theappear .Plant disease can be detected by image processing.The main aim of our project is to identify the disease and provide necessary pesticides to increase the quality of the crops.

Article History
Article Received*: 24 July 2019*
Revised*: 12 September 2019*
Accepted*: 15 February 2020*
Publication*: 09April 2020*

Keywords: *Disease detection, Imageprocessing, Convolutional neural network, Productionrate, Affected region.*

I. INTRODUCTION

Agriculture is the foremost occupation that has evolved in India.Food is the vital source of humans energy.It provides neccessary nutrients, proteins ,vitamins and carbohydratesso as very individual directly or indirectly depends on agriculture.Plant disease are mostly caused by fungus,virus,bacteria,nutrientaldeficiency which may cause damage to crops and reduces yield.Due to the increase in population and some other climatical factors also it gets affected as a result there is loss of income to famers ,increase in price of crops, less nutrients to humans .The most common approach to detect plant disease is detection and classification.Both of these can be done using deep learning algorithm in machine learning process.

Bacterial leaf spot is a Bacterial disease that is usually small yellow green substance on the small leaf that soon appear water-soaked.These later expand into dry deadspots.It may eventually extend to the full length of the leaf. Lesion usually occur on the culm.At severe stage a gray milky liquid substance can be squeezed from the end the leaf. It most occurs on the over winter.

Figure 1.1Bacterial Blight

Anthracnose is a fungal disease that occurs mostly on warm and moist seasons. These disease mostly occurs on muskmelon,cucumber and watermelon. Squash and pumpkins are rarely affected to these disease.Thefirst symptom are dark brown spots with

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black margin on the leaf.They varies depending on specific fungus and plants.

AlternariaAlternata is ubiquitous saprophyte that is found on soil and plants .Alternariamold is dark with a velvety texture.It can be spread with splashing water.It survives from season to season in plant.

Figure 1.2 Squash Anthranose

Leaf spot is common disease applied to number of disease applied to shade trees.The disease are majorly caused by fungus ,but some are by bacteria.Some disease are caused by insects.It is highly contagious .It can be caused by warm,moist conditions .It mostly affect roses. Leaf spot are usually brown-,black ,tan or reddish in colour

Figure 1.3 AlternariaAlternata

Figure 1.4 Leaf Spot

Data mining is term refer to as extraction of a particular information from a large set of data.The features of data mining can be adopted in identification of diseased leaf.Data mining along with image processing can be used for the following purposes:

1. Determing the shape of affected region.
2. Finding the colour of affected region.
3. Analysing the infected leaves.
4. Influence of the disease in that leaf.

The Farmer is to take a picture of the affected region of the leaf and the image is processed inside to show the disease and the appropriate pesticides for its recovery.Here the paper uses Convolutional neural network to study the disease classification process. we identify disease such as Anthracnose ,AlternariaAlternata,Leaf spot and Bacterial Blight.These disease are usually seen on every plant varieties.It can be extended future for N number of diseased species.These disease tends to be in every plants .It can be done also be done for a particular variety of plants for large scale purposes.Black propagation method can be used for adjustments in the trainee dataset.

II. PROPOSED METHODOLGY

The algorithm used here is CNN(Convolutional neural network).It is a class of deep learning algorithm that is used for analyzing visual imagery.They are also called space invariant artificial neural network.It is mainly used for image

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processing,segmentation ,classification and for some correlated data. The main advantage of using CNN is that it automatically detects the important features.

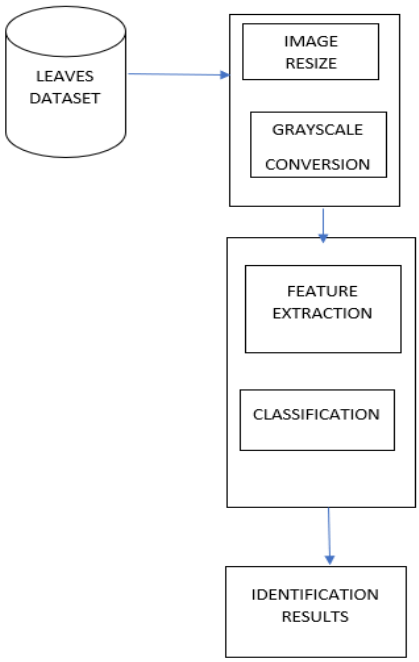

Figure 2.1 Framework Archiecture

The process that are involved in the detection of plant leaf disease are :

Image acquisition, Image pre-processing,Image resize, Adaptive Histogram and Gaussian Blur.

The algorithm steps involved in classification of disease are:

- Acquisition of RGB image.
- Conversion of RGB image to digital conversion.
- Removal of noise and image resize.
- Applying k-means clustering for image segmentation.
- Feature Extraction by Convolutional neural network.

Image Acquisition:

The disease affected plant is captured through Rasberry pi camera.The acquired image will be in RGB colour (Red Green Blue).The transformation structure is applied as the acquired RGB image is device dependent structure.so inorder to make it to digital conversion we go for gray scale conversion

Image Pre-Processing:

For removal of noise in the acquired image various pre-processing techniques like luminosity method or RGB to gray converter method (weighted method).Weighted method is preferable as compare to luminosity method as a problem occurs in average which is avoided in weighted method. Pre-processing is done as amoung these three colours red has more wavelength,and green is less compared to red and it has a soothing effect to eyes.so inorder to remove this variance it is necessary to decrease the contribution of red, Increase the wavelength of green and blue in the centre. The equation becomes:

Grayscale =(0.3*R)+(0.5*G)+(0.11*B).As from this, It is seen that Blue has contributed 11% ,Red has contributed 30% and Green has contributed 50% which is greater than the other two colours.

Image Resize:

The acquired document image is larger to fed into CNN as the resolution of the image will be 2000*2000 which is too large for the current availability of computerresources.These input not only need high computer resources but also leads to overfitting of data.After using pre-processing techniques the resolution of image get reduced to 400*400.It can also be reduced to our convience.

Clahe:

Ordinary Adaptive Histogram over amplify contrast in the near constant regions as it increases noise in that region. Contrast Limited Adaptive Histogram is one which reduces the noise problem by limiting the contrast in the region.

Convolutional neural network:

After the process of removing noise it is necessary for classification of data.For feature extraction we use CNN .The purpose of using this is to learn with non-linear input to classify complex layouts.First is

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to perform down sampling and pixel value and then feed it into CNN to classify class labels.

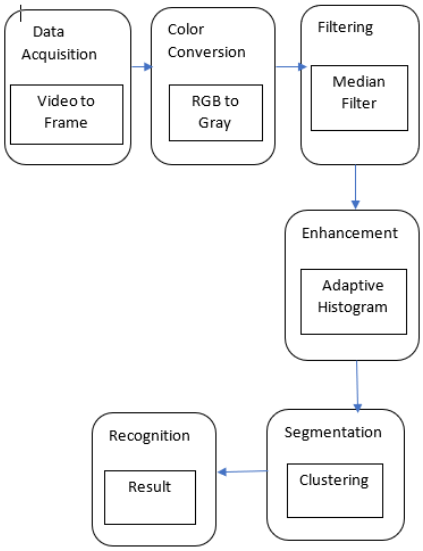

Figure 2.2 Schematic Flow Of Detection

The leaf of the plant are acquired through the camera .we trained the data sets of good leaves and infected leaves by feature extraction .The acquired image is verified with the good trainee data .The feature extraction is done by converting the image acquired cells to a particular value.If the taken leaf image matches with the data set stored it displays the disease along with the pesticides to spray .It can also be improved by sending the image to a central web server and get the disease name through notification in the phone.

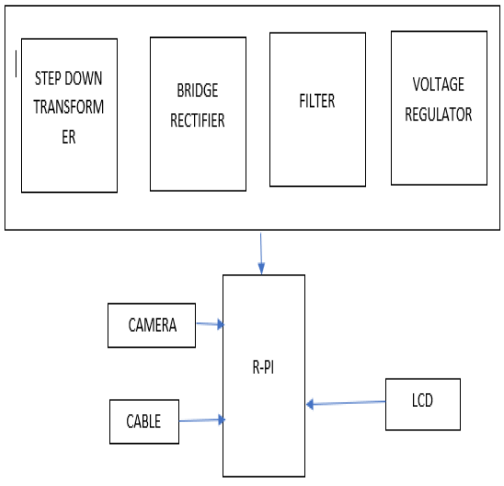

Figure 2.3 Hardware Connection

III. PROGRAM IMPLEMENTATION

Lcd Initialization

lcd_rs =25

lcd_en =24

lcd_d4=23

lcd_d5=17

lcd_d6=18

lcd_d7=22

lcd_backlight=4

lcd_columns=16

lcd_row=2

Camera Initialization

Camera=picamera()

Camera.start_preview()

Run The Inference

Print(“disease name pesticide name”)

lcd.clear()

lcd.set_cursor(0,0)

lcd.message(“bacteria name”)

lcd.set_cursor(0,0)

lcd.message(“pesticide name”)

IV. APPLICATION

The detection can be further used for the following agricultural process such as

- Detecting leaves with disease.
- Finding the structure of the affected area.
- To Determine the colour of the diseased area.
- It can be used in the silk trees to produce quality material.
- Texture analysis by determing size and shape of the leaf.

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- It can be implemented to disease diagnosis on smart phones.
- It can be further extended to a set of diseases.

V. RESULT AND DISCUSSION

Here we used CNN algorithm for feature extraction and classification.This algorithm gives higher accuracy with 94% which is better than other deep learning algorithm such as ANN ,support vector machine.The output of our project is given below:

Figure 5.1 Healthy Leaves

Figure 5.2Anthranose Disease

VI. CONCLUSION

In this project the detection techniques are doneby means of intensity computation,thresholding which are used to classify four different type of diseases 94% As an extension of our work, it is suggested to optimize the features selected and the foremost features with different classifier techniques can be compared and analyzed.

VII. ADVANTAGES

- The advantage of using CNN is it produces higher identification accuracy and higher processing speeds.
- It can identify the abnormalities in leaf at the earlier stage so it can be prevented from attacking further.
- Machine learning offers a great chances of self-recognition of infected plants by visual imagery.

VIII. FUTURE SCOPE

- For further it can be hybrid with other algorithms for better accuracy and efficiency of identification and classification using colour and texture analysis.
- The working of this experiment can be diversed by using advanced separation me
- thods to separate the class labels from a complex noise image.

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