

PLANT LEAF DISEASE DETECTION

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ABSTRACT

We know that India is an agriculture based country. There is diversity in the crops. India is largest in production of wheat, rice, cotton, jawar-bajra etc. About 70% of people from India depend on farming as their primary economic source. Due to having diversity in crops there is diversity in diseases also. Diseases hamper the quality and quantity of the product and hence affect the economy of India. Generally proper detection of disease is impossible by naked eye. Traditional method for detection of disease is, we call the expert who gives suggestion about the type of disease and what are the methods for cure it. But sometimes the naked eye observation can get false and unnecessary fertilizers get spread on leaf having no effect on leaf. To solve this problem, we can accurately detect disease by using Digital Image Processing which give accurate information about causes, effects and fertilizers need to spread. In this project classification of disease is based on neural network. Different MATLAB pre-processing algorithms are use for detecting the disease. After successful classification and detection of disease, one can spread suitable fertilizers by using wired robot.

KEYWORD: Neural Network, Matlab.

INTRODUCTION:

The position of any country in the world depends on its economy and the economy of most of the countries depends on agricultural production. Pproduction get affected by diseases of the crop. The diseases on the cotton are caused by pathogens, deficiency of nutrients, fungi etc. Detection and identification of such types of diseases requires an expert system. Which also describe the method of prevention and treatment. Identifying the plant disease is not easy task. It requires experience and knowledge of plants and their diseases. This is check and error system which requires lots of time. This method is expensive which requires continuous watch over farm. To solve this problem we are using image processing and some MATLAB classification tools. In this project we are classifying and identifying disease on cotton leaf. The diseases on cotton are as follows.

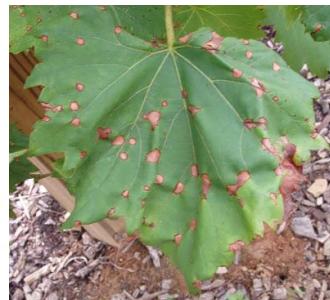
Viral diseases	
Abutilon mosaic = Malvaceous chlorosis virus*	suspect Begomovirus (Bemisia tabaci transmitted)
Anthocyanosis	suspect virus
Blue disease	suspect virus or phytoplasma
Leaf crumple	genus Bigeminivirus, Cotton leaf curl virus (CLCuV)
Leaf curl	genus Bigeminivirus, Cotton leaf curl virus (CLCuV)
Leaf mottle	suspect virus (etiology unknown)
Leaf roll	suspect virus (etiology unknown)
Mosaic	suspect virus (etiology unknown)
Psylosis	suspect virus (etiology unknown)
Terminal stunt	suspect virus (GTP; Cicadellidae associated)



2.1 Rust



2.2 Fussarium



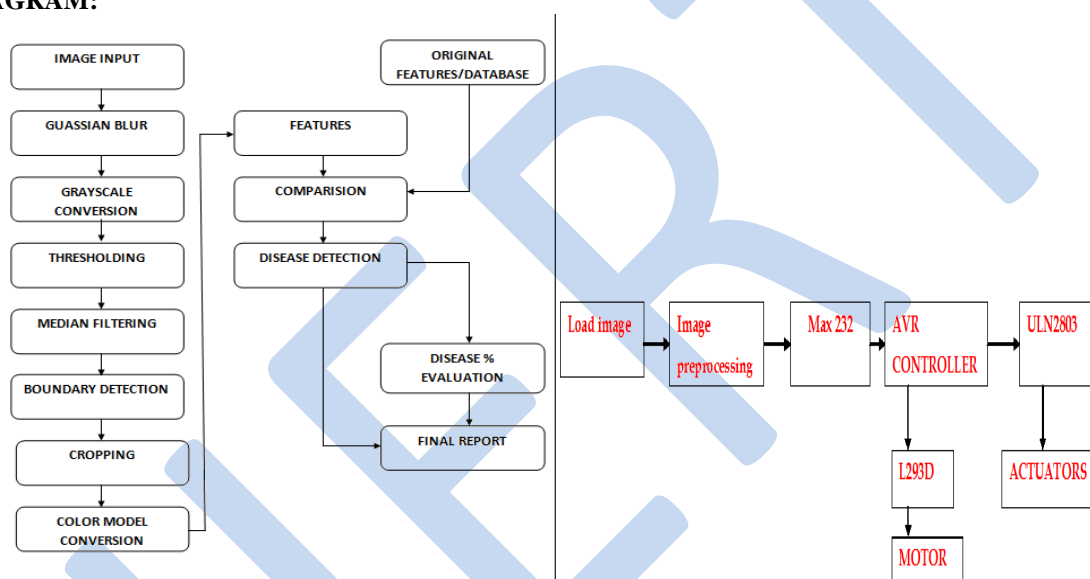
2.3 Rendning

LITERATURE SURVEY

Various methods are suggested in some papers to detect leaf diseases has illustrated and discussed here.

[1] In this paper consists of two phases to identify the affected part of the disease. Initially Edge detection based Image segmentation is done, and finally image analysis and classification of diseases. This work the input images using the RGB pixel counting values features used and identify disease wise and next using homogenization techniques Sobel and Canny using edge detection to identify the affected parts of the leaf spot to recognize the diseases boundary is white lighting and then result is recognition of the diseases as output.[2] in this paper detection of leaf diseases has been used method is threefold: 1) identifying the infected object based upon k-means clustering; 2) extracting the features set of the infected objects using color co-occurrence methodology for texture analysis; 3) detecting and classifying the type of disease using NNs, moreover, the presented scheme classifies the plant leaves into infected and not-infected classes. [3] In this paper a comparison of the effect of CIELAB, HSI and YCbCr color space in the process of disease spot detection is done. All these color models are compared and finally a component of CIELAB color model is used. [4] In this paper Support vector machines are a set of related supervised learning method used for classification and regression. The detection accuracy is improved by SVM classifier. [5] The process of image segmentation was analyzed and leaf region was segmented by using Otsu method. In the HSI colour system, H component was chosen to segment disease spot to reduce the disturbance of illumination changes and the vein. Then disease spot regions were segmented by using sobel operator to examine disease spot edges. Finally plant diseases are graded by calculating the quotient of disease spot and leaf areas.

BLOCK DIAGRAM:



4.1 Software flow chart

4.2 Hardware block diagram

METHODOLOGY

Firstly image of the defected leaf is taken and different pre-processing algorithms are applied on them. Different pre-processing algorithm includes Gaussian blurring, grey scale conversion, thresholding, median filtering, boundary detection, cropping etc.1) grey scale conversion converts RGB image into gray scale image, for this we take the average of R,G,B i.e.(R+G+B)/3 . The simplest thresholding methods replace in an image with a black pixel if the image intensity is less than some fixed constant T (i.e. $I(i,j) < T$) or a white pixel if the image intensity is greater than that constant. Cropping refers to the removal of the outer parts of an image to improve framing, accentuate subject matter or change aspect ratio. Edge detection includes a variety of mathematical methods that aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. After this by using tools in matlab we take features of defected leaves. These features are compared with features of small pixels having diseases like bacteria, rendning, rust etc which is saved as database. Classification and comparison of disease is done by Neural Network. Some of the pre-processing in matlab shown below.

```
[fname, path] = uigetfile ('*. *', 'Load Image');

fullPath = strcat (path, fname);
input Image = imread (fullPath);
imshow (input Image, 'parent', handles.axes1);
gs = rgb2gray (input Image);
imshow (gs, 'parent', handles.axes2);
BW = im2BW (input Image, 0.5);
imshow (BW, 'parent', handles.axes3);
```

5.1 Pre-processing

Artificial neural networks are computational system whose concept is derived from biological neural networks. An ANN consists of a collection of processing elements that are highly interconnected and transform a set of inputs to a set of desired outputs. The result of transformation is determined by the characteristics of the elements and the weights associated with the interconnections among them. Matlab code for trained ANN is as follows

```
P = [finalData'];
T = sOutput';

net = newff( P , T ,10);
net.trainParam.epochs = 100;
net = train(net, P, T);
%Y = sim(net, P);
netInitialized = 1;
-msgbox ('Neural Network Trained!');
```

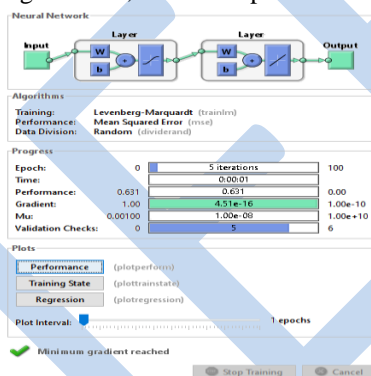
All this pre-processing steps we are displaying on the screen through the GUI(Axes) tools in MATLAB. When the comparison is done it gives the reason and category of the disease on leaf. In this project disease caused is shows in the form of percentage, so it is helpful for us to understand how much amount of fertilizer required to overcome the disease. In this way we successfully identify the disease on leaf by using image processing. After detection of disease data in the binary form is sent to controller, which takes place by using UART1 .

```
case 33 :
    DDRA = 0xff;
    PORTA = UART1_Readchar();
    break;
```

Controller receives data and then actuators gets ON at output port of controller.

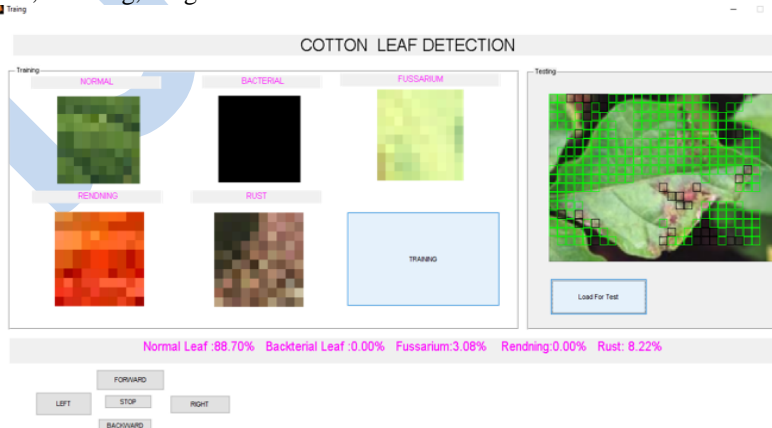
RESULTS

We can successfully detect disease on given leaf, Which help to increase productivity.



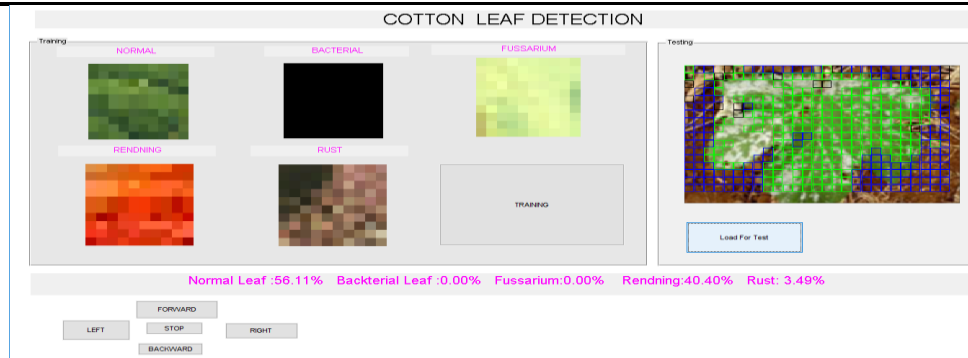
6.1 Trained neural network

we successfully trained Neural Network, using 5 iterations. In our project we take the features of small pixels images which are having the diseases like bacteria, Redning, fungus and rust.



6.2 Rust leaf

Here we load the image of leaf, which shows us that it is defected 8.22% by Rust. Which also shows percentage of normal leaf. From this data we can spray suitable fertilizers to remove rust from leaf.



6.3 Rendning

Here we load image, which show us that percentage of normal leaf is 50.11% and about percentage of rendning i.e. 40.40%, so from this information we can accurately detect the cause of disease and we will spray suitable fertilizer on that. Which help us to recover from disease and it will increase the quality of product



6.4 Hardware

In hardware we use AVR controller as it process data which come from UART1 and after necessary action takes place and Actuators will turn ON.

CONCLUSION AND FUTURE SCOPE:

We discussed that, correct identification of disease is a difficult by naked eye, called the experts system. This system is time consuming and there is no guarantee that identified disease will be correct or not. So with reference to this project by using image processing we can successfully identify and classify the disease by using Neural Network. Because of this we can help farmers to increase their productivity, quality and quantity of the products.

In future, we trained lots of diseases and showing their causes, effects and about fertilizers used. We also use the wired robot which can reach to that site and actuators starts working which will act as spraying device in defected areas.

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