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AUTOMATIC AGRICULTURAL CROP MAINTENANCE SYSTEM USINGMACHINE LEARNING

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Abstract. Plant diseases serve as a major threat to food supply. The proposed system helps in identification of plant disease and provides remedies that can be used as a defense mechanism against the disease. The database obtained from the Internet is properly segregated and the different plant species are identified and are renamed to form a proper database then obtain test-database which consists of various plant diseases that are used for checking the accuracy and confidence level of the project. Then using training data we will train our classifier and then output will be predicted with optimum accuracy. We use Convolution Neural Network (CNN) which comprises of different layers which are used for prediction.

Keywords: Agriculture ,prediction,crop yield,

1. INTRODUCTION

The primary occupation in India is agriculture. India ranks second in the agricultural output worldwide. Here in India, farmers cultivate a great diversity of crops. Various factors such as climatic conditions, soil conditions, various diseases etc affect the production of the crops reducing the ability of the crop to fight back. Most importantly identifying the plant crop diseases and classification of it has become an easy process compared to the earlier days. Now a day's technology plays vital role in all the fields but till today we are using some old methodologies in agriculture. Identifying plant disease wrongly leads to huge loss of yield, time, money and quality of product. Identifying the condition of plant plays an important role for successful cultivation. In olden days identification is done manually by the experienced people but due to the so many environmental changes the prediction is becoming tough. The prevention and control of plant disease have always been widely discussed because plants are exposed to outer environment and are highly prone to diseases. Normally, the accurate and rapid diagnosis of disease plays an important role in controlling plant disease, since useful protection measures are often implemented after correct diagnosis. Since humans are subjected to tiredness and the automated system also helps to reduce the time consumed by manual techniques. The deficiency of labors, automatic system needs to be incorporated to minimize the work and many new farming computerization tools are being established by university investigators that pose questions about the Effectiveness with which we succeed current farming practices.

Deep learning is itself a self-learning technique used on large amounts of data, and recent developments in hardware and big data have made this technique more practical. Deep neural networks have recently been

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successfully applied in many diverse domains as examples of end to end learning. Neural networks provide a mapping between an input—such as an image of a diseased plant—to an output—such as a crop diseased pair. One of the algorithms in deep learning is CNN and it is used to analyze an image and pre process it very easily along with the help of image processing technique. The CNN models provide a relationship between layers and spatial information of the image and make it convenient for classifying the image.

A Convolutional Neural Network (CNN) is a neural network that has one or more convolutional layers and is used mainly for image processing, classification, segmentation and also for other auto correlated data.

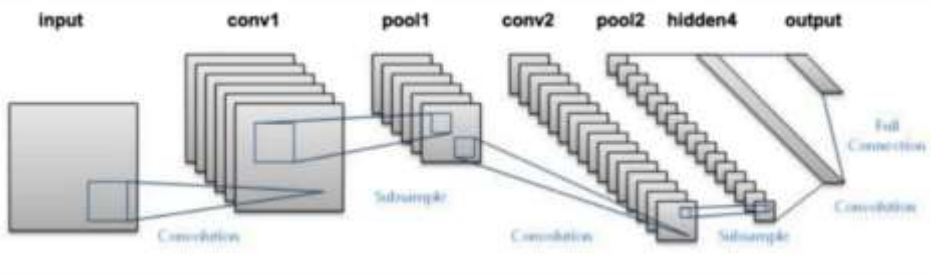

FIG.1: Convolutional Neural Network

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be an image with more particular about characteristics or features associated with that original image. Digital image processing techniques help in manipulation of the digital images by using computers. There are phases that all types of data have to undergo while using digital technique is

1. Image Acquisition,
2. Image Restoration,
3. Image Segmentation,
4. Image Enhancement,
5. Image Recognition.

1.1 MOTIVATION

The agronomic requirements in different ways are raised for those who are currently using these have given rise to many new chances to service. So they should be tested via non-destructive techniques because leaves are delicate part of plant and also the evaluation of agricultural harvest and its classification is dynamic. The most important visual property of leaves is texture and color. Hence classification of leaf disease is necessary in evaluating agricultural produce, increasing market value and meeting quality standards. The process will be too slow if the identification and categorization is done through physical techniques so. When we started research we found that even after proposing many methodologies the disease detection and prevention did not reach to the standard level. In paddy crop we classify the leaves based on color, size, smell etc. If these qualities are put into right

methods and are recorded into automatic system by using appropriate program design language then the effort will be error free and faster.

1.2 PROBLEM STATEMENT

Agriculture is the most important occupation of our country. Down the line there was never that importance given for the improvement of new technologies in this field. But as the years go there were different proposal and inventions done but the major issue of the existing systems is to not have the accuracy of the predictions of diseases and finding out the diseases. But we proposed this method because CNN has the most exact values at the extraction of features from images and thus we could get a clear picture of the diseased plant.

1.3 OBJECTIVES

The main objectives behind the development of this project are:

1. The efficiency and accuracy of the disease detection is to be higher than the existing models.
2. Time taken to detect the diseased part and predict the disease has to be very less.
3. More easier and comfortable approach to help the farmers in preventing their crop from destruction.

2. LITERATURE SURVEY

Cui et al., [1] have proposed image analysis techniques for measuring rust sickness found on soybean leaves. Division of contaminated territories from multi-phantom pictures of soybean plant leaves is finished utilizing quick manual edge setting strategy in light of HIS shading model.

Bhumika S.Prajapati, Vipul K.Dabhi et al., [2] have proposed the detection and classification of cotton leaf disease using image processing and machine learning techniques was carried out. Also the survey on background removal and segmentation techniques was discussed. Through this survey, we concluded that for background removal color space conversion from RGB to HSV is useful. We also found that thresholding technique gives good result compared to other background removal techniques. We performed color segmentation by masking green pixels in the background removed image and then applying thresholding on the obtained masked image to get binary image. This is useful to extract accurate features of disease. We found that SVM gives good results, in terms of accuracy, for classification of diseases. There are five major steps in our proposed work, out of which three steps have been implemented: Image Acquisition, Image pre-processing, and Image segmentation.

Kholis Majid et al., [3], have designed a convenient application for paddy plant disease with recognizable proof structure using fluffy entropy and Probabilistic neural framework classifier that continues running on Android adaptable's working system. It incorporates for sorts of ailments specifically darker spot, leaf impact, tungro and bacterial leaf curse.Anup Vibhute et al., [4] had done a survey on different applications of image processing in agriculture. They made a survey on two different applications which are weed detection and fruit/food grading

system. Weeds are harmful to the crops, so from the images of crops weed crops can be detected by different image processing techniques.

Barbedo et al., [5] has completed an overview on disease classification in plant crops using image recognition techniques. These strategies are anticipated to be valuable for scientists giving far reaching diagram of vegetable pathology and programmed discovery of plant ailments utilizing design acknowledgment systems.

Auzi Asfarian et al., [6] has tried to recognize the four critical paddy infections in Indonesia to be particular leaf impact, darker spot, bacterial leaf curse and tungro. Fractal descriptors are used to dismember the piece of the wounds.

S.A. Ramesh Kumar et al., [7] discussed various data mining techniques for paddy crop disease prediction and classification.

P.Revathi, M.Hemalatha et al., [8] proposed a work which is based on Image Edge detection Segmentation techniques in which; the captured images are processed for enrichment first. Then R, G, B color Feature image segmentation is carried out to get target regions (disease spots). Later, image features such as boundary, shape, color and texture are extracted for the disease spots to recognize diseases and control the pest recommendation. In this Research work consist three parts of the cotton leaf spot, cotton leaf color segmentation, Edge detection based Image segmentation, analysis and classification of disease.

Malvika Ranjan, Manasi Rajiv Weginwar& et al., [9] describes a diagnosis process that is mostly visual and requires precise judgment and also scientific methods.

Image of diseased leaf is captured .As the result of segmentation Color HSV features are extracted. Artificial neural network (ANN) is then trained to distinguish the healthy and diseased samples. ANN classification performance is 80% better in accuracy.

Heeb Al Bashish, Malik Braik & et al., [10] in this paper proposed an image-processing-based approach is proposed and used for leaf and stem disease detection. We test our program on five diseases which effect on the plants and they are: Early scorch, Cottony mold, ashen mold, late scorch, tiny whiteness. The proposed approach is image-processing-based. In the first step of the proposed approach, the images at hand are segmented using the K-Means technique, in the second step the segmented images are passed through a pre-trained neural network. As a testbed we use a set of leaf images taken from Al-Ghor area in Jordan.

Y.Sanjana, AshwathSivasamy et al., [11] proposed a model which describes **t**he uploaded pictures captured by the mobile phones are processed in the remote server and presented to an expert group for their opinion. Computer vision techniques are used for detection of affected spots from the image and their classification. A simple color difference based approach is followed for segmentation of the disease affected lesions. The system allows the

expert to evaluate the analysis results and provide feedbacks to the famers through a notification to their mobile phones. The goal of this research is to develop an image recognition system that can recognize crop diseases. Image processing starts with the digitalized color image of disease leaf. A method of mathematics morphology is used to segment these images. Then texture, shape and color features of color image of disease spot on leaf were extracted, and a classification method of membership function was used to discriminate between the three types of diseases.

Jundare Manisha, Jundare Pallavi, Jundare Pragati, Prof. C.S.Aryan& et al., [12] given "Plant Disease Detection and its Treatment using Image Processing" and also mentioned in their research that India is farming nation, Approx. 20 % of harvest yield is missing universal due to pest attack every year which is valued around Rs. 90,000 million. Saving 5 Rs. is like earning 5 Rs. farmers have been using a pesticide, which increases the crop yield to avoid loss.

Remains problems in environment due to large use of pesticides harms to soil, sharp toxicity to humans and natural world, change in insect type in agro ecosystems, high cost of control practices etc. Fungus are very known dangerous insects there on grass of plant, send out steamy honeydew, reason loss of leaves and harm the harvest surrender. The visual judgment of farmers is counting of whiteflies has been mostly relied. The illustration decision by farmers for bulk of whiteflies has been less accurate Because of the identification skills has different levels. In laboratory also detection of present whiteflies on leaves, it takes extended time for detection of whiteflies at early on stages has become important because off inimical importance of harvests and strong impacts of damage levels. In proposed solution, using web application, whiteflies on leaves of plant at early stages we are calculating no. of eggs also. By this technique, farmers are capable of improve 80 % of lost that will cause due to pest occurrence.

Prakash M. Mainkar, Shreekant Ghorpade, Mayur Adawadkar & et al., [13] proposed Plant Disease Detection and its Treatment using Image Processing Leaf Disease Detection and Classification Using Image Processing Techniques, and mentioned in their research that Agriculture is the mainstay of the Indian economy. Almost 70% people depend on it & shares major part of the GDP. Diseases in crops mostly on the leaves affects on the reduction of both quality and quantity of agricultural products. Perception of human eye is not so much stronger so as to observe minute variation in the infected part of leaf. In this paper, we are providing software solution to automatically detect and classify plant leaf diseases. In this we are using image processing techniques to classify diseases & quickly diagnosis can be carried out as per disease. This approach will enhance productivity of crops. It includes several steps viz. image acquisition, image pre-processing, segmentation, features extraction and neural network based classification. The study reviews and summarizes image processing techniques for several plant species that have been used for recognizing plant diseases. The major techniques used are K-means clustering, GLCM and BPNN. Some of the challenges in these techniques are optimization of the technique for a specific plant, effect of the background noise in the acquired image and automation technique for a continuous automated monitoring of plant leaf diseases under real world field conditions.

In summary, various image processing techniques have proposed for plant disease detection. Yet none of them proved to be efficient for identification of all kinds of paddy crop diseases. Thus, it is important to correctly diagnose a disease before proffering management options. Diagnosis, being the process of determining the cause of a problem requires the attention of an expert. Extract the features of infected leaf and the classification of plant diseases.

3.ANALYSIS

Analysis is one of the most important phases of the project. The main part of analysis phase is to study the existing systems and understand the requirements for the further research and development.

3.1 EXISTING SYSTEMS

Finding out a disease from a plant leaf by naked eye was a long ago traditional method. In the past there were different approaches and methods implemented for identifying the diseases in paddy plant using different technologies. But the major drawback was to not get the accuracy properly and ultimately fail in the detection of the disease. There were very few models with the decent accuracy but could not be developed because of the non availability of that mechanism to farmers in an easy and productive way.

3.2 PROPOSED SYSTEM

We titled our project as “Paddy Crop Disease Detection using CNN”. In this project we are using one of the best deep learning techniques called CNN (Convolutional Neural Network) and also Image Processing for the identification, detection and prevention of paddy crop.

We are executing this in the Matlab software which provides a platform for features extraction of datasets through digital image processing. We also added a feature of giving remedies to the particular disease in order to cure it before any destruction. This is one of main features which was lacking in the existing models and can be very helpful if used in the proper way.

3.2.1 CONVOLUTIONAL NEURAL NETWORK (CNN)

Convolutional Neural Networks are very similar to ordinary Neural Networks. They are made up of neurons that have learnable weights and biases. A convolutional Neural Network is comprised of convolutional layer and then followed by fully connected layer as in standard multilayer neural network. A convolutional neural network consists of an input and an output layer, as well as multiple hidden layers. The hidden layers of a CNN typically consist of a series of convolutional layers that convolve with a multiplication or other dot product. The activation

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function is commonly a RELU layer, and is subsequently followed by additional convolutions such as pooling layers, fully connected layers and normalization layers.

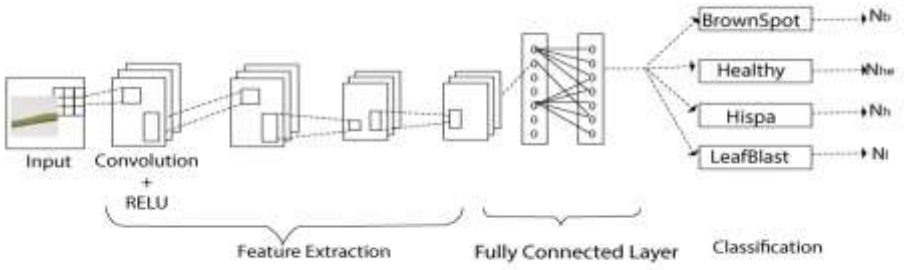

FIG.3.2.1: Architecture of CNN

There are various layers in CNN model. They are:

a. Convolution Layer:

The main building block of CNN is the convolutional layer. Convolution is a mathematical operation to merge two sets of information. The primary purpose of Convolution in case of ConvNet is to extract features from the input image Convolution preserves the spatial relationship between pixels by learning image features using small squares of input data. A convolutional Neural Network is comprised of convolutional layer which is applied on the input data using a convolution filter to produce a feature map.

In our case first input image are stored in convent with image size as height, width and number of channel. Next we have 5 layers of convolution and pooling, we added a convolution layer by using the"Conv2D" function. The Conv2D function is taking 4 arguments, the first is the convent of image input size of previous, second is the dimension, third one filter, the fourth argument is the activation function i.e reLU activation to make all negative value to zero here 'relu' stands for a rectifier function.

$W = (w - F + 2Ps)/s + 1$

$H = (H - F + 2P)/s + 1$

Where,

W = width of input,

H = height of input,

F = filter size,

P = padding,

S = Stride,

D = Depth or channel.

b. Pooling Layer:

A pooling layer performs a down sampling operation along the spatial dimensions (Width, Height), resulting dimensionality reduction. The primary aim of pooling operation is to reduce the size of the images as much as possible. This scans across the image using a window and compresses the image extracting features.

Max pooling and average pooling are the most common method used in pooling layers. Max pooling takes the largest value from the window of the image currently covered but the kernel, while average pooling takes the average of all values in the window.

For a given input the size of (W1xH1xD1), the output from the max pooling layer can be calculated using the formula:

Requiring two hyper parameters filter size (f), stride (s) which produces a volume of size (W2xH2xD2) where

W2 = (w1-F)/s+1,

H2 = (H1-F)/s+1,

D2 = D1.

c. Fully Connected layer:

After the convolution + (plus) pooling layers we add a couple of fully connected layers to wrap up the CNN architecture. It connects neurons in one layer to neurons in another layer. It is used to classify images between different categories by training. This layer takes an input volume (whatever the output is of the conv or relu of pool layer) and output an N dimensional vector where N is number of classes that the program has to choose from.

Basically, a FC layer looks at what high level features most strongly correlate to a particular weight so that when you compute the products between the weights and the previous layer, you get the correct probabilities for the different classes.

d. Dropout Layer:

Dropout is used to prevent overfitting and the idea is very simple. During training time, a neuron is temporarily "dropped" or disabled with probability p at each iteration. This means all the inputs and outputs to this neuron will be disable at the current iteration. The dropped-out neurons are resampled with probability p at every training step, so a dropped-out neuron at one-step can be active at the next one. The hyperparameter *p* is called the dropout-rate and it is typically a number around 0.8, corresponding to 80% of the neurons being dropped out.

e. Activation Function:

Activation function decides, whether a neuron should be activated or not by calculating weighted sum and further adding bias with it. The purpose of the activation function is to introduce non-linearity into the output of a neuron. There are various types of activation function available such as sigmoid, Tanh, ReLU, Softmax, etc. ReLU activation is used in hidden layers and Softmax at last layer.

f. ReLU:

ReLU stands for Rectified linear unit. It is the most widely used activation function. It is mainly implemented in hidden layers of neural networks.

The equation is *A(x) = max (0, x)*. It gives an output x if x is positive and 0 otherwise.

The value Range is [0, inf).

The nature is non-linear, which means we can easily back propagate the errors and have multiple layers of neurons being activated by the ReLU function.

The Uses are ReLU is less computationally expensive than Tanh and sigmoid because it involves simpler mathematical operations. At a time only, a few neurons are activated making the network sparse making it efficient and easy for computation.

g. Softmax:

The softmax function is also a type of sigmoid function but is handy when we are trying to handle classification problems. It is non-linear in nature. Softmax is used majorly when trying to handle multiple classes.

The softmax function would squeeze the outputs for each class between 0 and 1 and would also divide by the sum of the outputs. The softmax function is ideally used in the output layer of the classifier where we are actually trying to attain the probabilities to define the class of each input.

S(y) =$eyi/\Sigma yi$

h. Stride:

Stride is the number of pixels by which sliding is done in the filter matrix over the input matrix When stride is 1 then filters are moved one pixel at a time. Having a large stride will produce smaller feature maps.

3.2.2 IMAGE PROCESSING

Digital image processing deals with manipulation of digital images through a digital computer. It is a subfield of signals and systems but focus particularly on images. DIP focuses on developing a computer system that is able to perform processing on an image. The input of that system is a digital image and the system process that image using efficient algorithms, and gives an image as an output. The system use CNN to extract features and classify the image by the user by following image pre-processing steps.

The pre-processing steps involved in this technology are explained below:

a. Image Acquisition:

In Acquisition process images of the diseases plants are captured through the high resolution camera. This image is in RGB (Red, Green and Blue) values form. Color conversion structure for the RGB leaf image is created, and then, a device independent color space conversion for the color variation is applied such as HIS model.

b. Image Restoration:

To remove noise in image or other object removal, image clipping i.e. cropping of the leaf image is done to get the interested image region. Image smoothing is done using the smoothing filter. Image enhancements are carried out for increasing the contrast and store it.

c. Image Segmentation:

Segmentation attempts to partition the pixels of an image into groups that strongly correlate with the objects in an image. Segmentation means partition of image into diverse part of same skin tone i.e. categories. It can also be called as having some likeness dissection which means parceling of picture into different part of same elements or having some likeness. The divisions should be possible utilizing different.

d. Image Enhancement:

The input image is enhanced to protect information of the pretentious pixels before color from the background. The color space equally is used to reduce effect of illumination and distinguish between disease and non disease leaf color inventively the resulting color pixels are clustered to acquire groups of colors in the image. This step can also be called as feature extraction.

e. Image Recognition:

This stage can also be named as classification. Multispectral classification is the process of sorting pixels into a finite number of individual classes or categories of data based on their data file values. If a pixel satisfies a certain set of criteria, the pixel is assigned to the class that corresponds to those criteria.

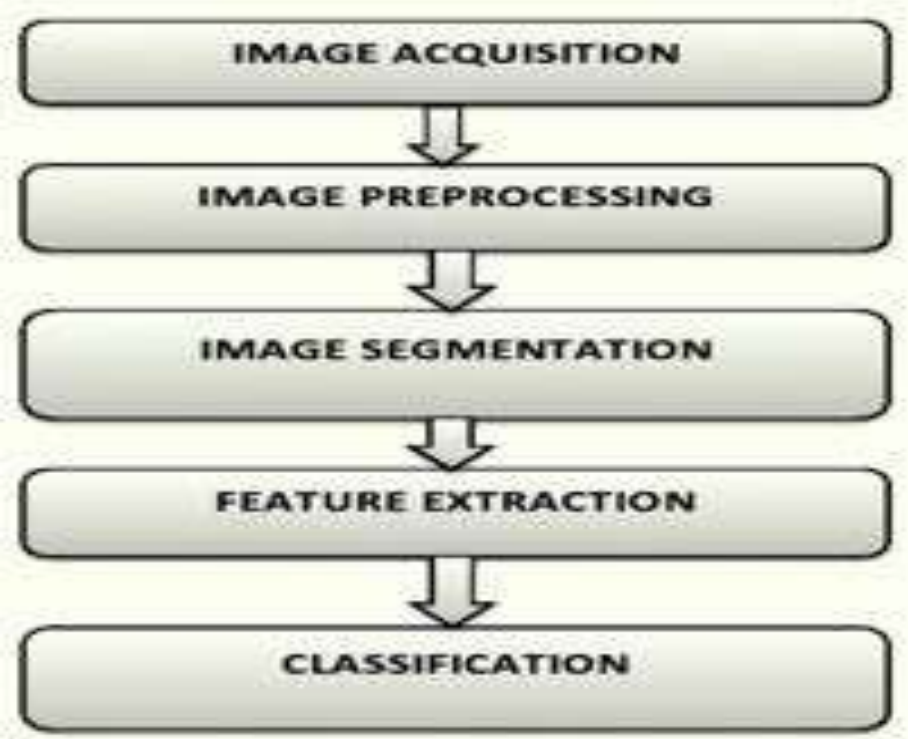

FIG.3.2.2: Image Processing Methodology

3.2.3 MATLAB SOFTWARE

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

Typical uses of Matlab software include:

- Math and computation,
- Algorithm development,
- Modeling, Simulation, and Prototyping,
- Data analysis, Exploration, and Visualization,
- Scientific and engineering graphics.

Matlab graphics system includes high-level commands for two-dimensional and three dimensional data visualization, image processing, animation, and presentation graphics. It also includes low-level commands that allow you to fully customize the appearance of graphics as well as to build complete Graphical User Interfaces on your Matlab applications.

3.3 REQUIREMENTS

3.3.1 PURPOSE

The primary occupation in India is agriculture. India ranks second in the agricultural output worldwide. Plant diseases serve as a major threat to food supply. The purpose of our project is to help in identification of plant diseases and provides remedies that can be used as a defense mechanism against the disease so that it may benefit the farmers and agricultural sector. We use Convolution Neural Network (CNN) which comprises of different layers which uses a training data we will train our classifier and then output will be predicted with optimum accuracy. The main purpose is to help farmers to prevent damage of crops and improve productivity.

3.3.2 SCOPE

The main difference for each one of the models comes from what your inputs and outputs you choose. We are using CNN and it is used to analyze an image and pre process it very easily along with the help of image processing technique. The CNN models provide a relationship between layers and spatial information of the image and make it convenient for classifying the image by Image processing to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it.

The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction. Unlike any other existing paddy crop disease detection methods, we have developed a model which runs in a very less time and also gives the more accuracy along with the remedies.

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4. DESIGN

4.1 METHODOLOGY

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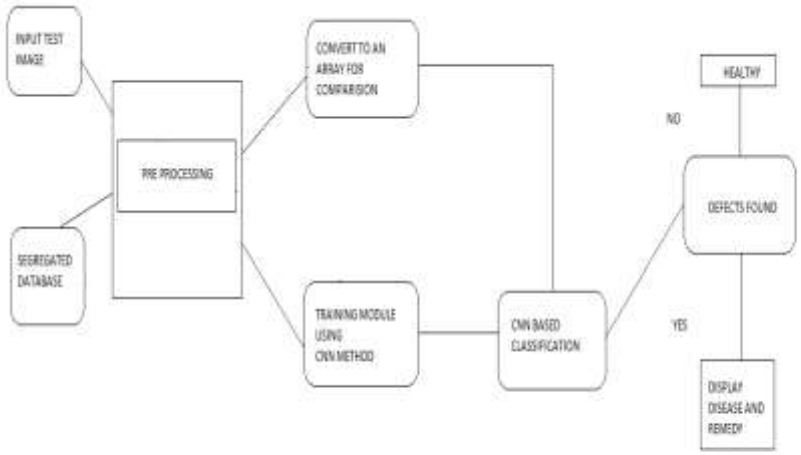

FIG.4.1: Methodology of the proposed system

4.2 UML DIAGRAMS

The Unified Modeling Language (UML) is a standard language for drawing software blue-prints. The UML is a language used for

a. Visualizing,

b. Specifying,

c. Constructing and

d. Aircrafts Documentation.

The UML is a language which provides vocabulary and the rules for combining words in that vocabulary for the purpose of communications. A modeling language is a language is a language whose vocabulary and the rules on the conceptual and physical representation of a system. Modeling yields an understanding of a system.

4.2.1 USE CASE DIAGRAM

A utilization case chart in the Unified Modeling Model (UML) is a sort of social defines characterized by way of and crafted from a use-case research. Its motivation is to display a graphical diagram of the usefulness given by way of a framework regarding acting artists, their goals and any conditions between the ones usage cases. The main aim of the use case diagram is to illustrate what framework capacities are carried out from which performer.

The below diagram is the use case diagram of our project:

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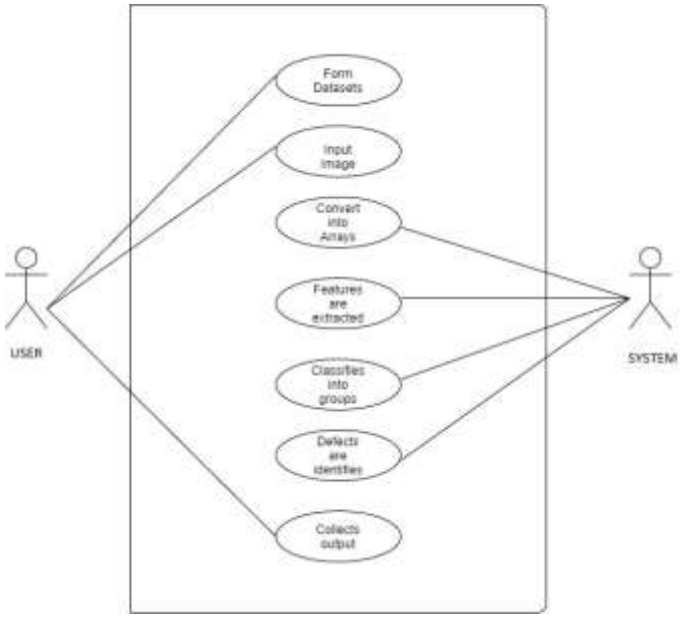

FIG.4.2.1: Use case Diagram

4.2.2 ACTIVITY DIAGRAM

Activity diagrams represent the business and operational workflows of a system. An activity diagram is a dynamic diagram that shows the activity and the event that causes the object to be in the particular state.

We use activity diagrams to illustrate the flow of control in a system and refer to the steps involved in the execution of a use case. Activity diagram is a behavioral diagram.

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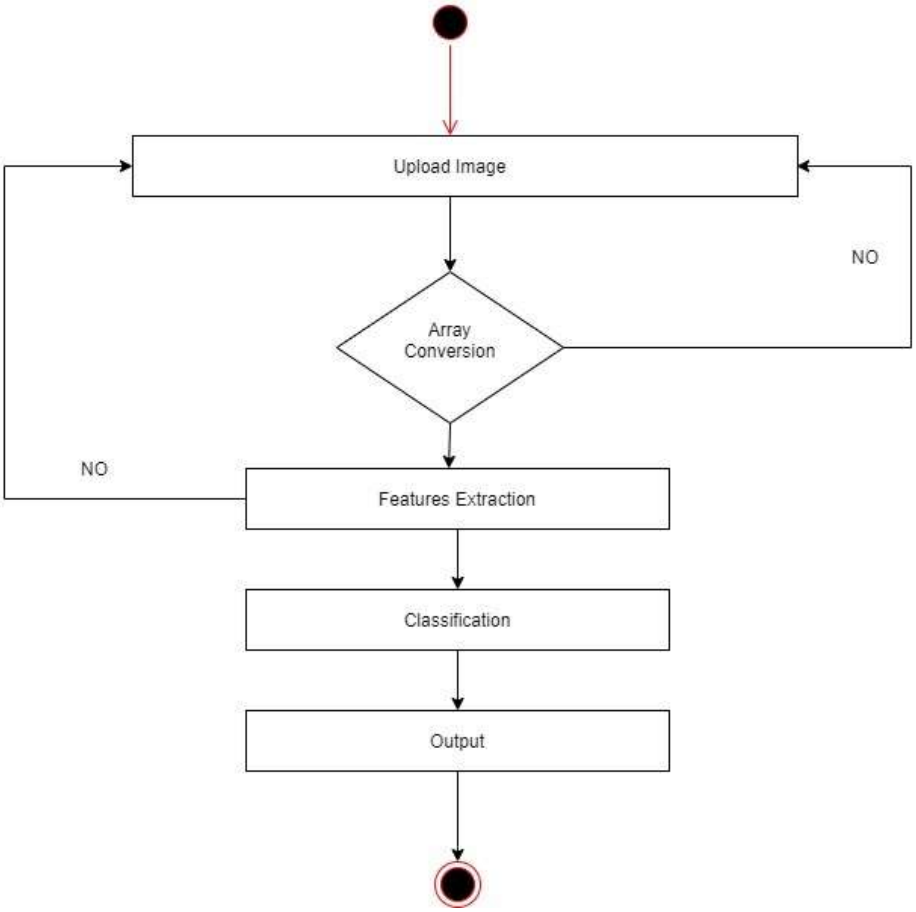

FIG.4.2.2: Activity Diagram

4.2.3 SEQUENCE DIAGRAM

A sequence diagram is the most commonly used interaction diagram. An interaction diagram is used to show the interactive behavior of a system. We use different types of interaction diagrams to capture various features and aspects of interaction in a system.

A sequence diagram simply depicts interaction between objects in a sequential order i.e. the order in which these interactions take place. In sequence diagram there are different notations like actor, lifelines, messages etc.

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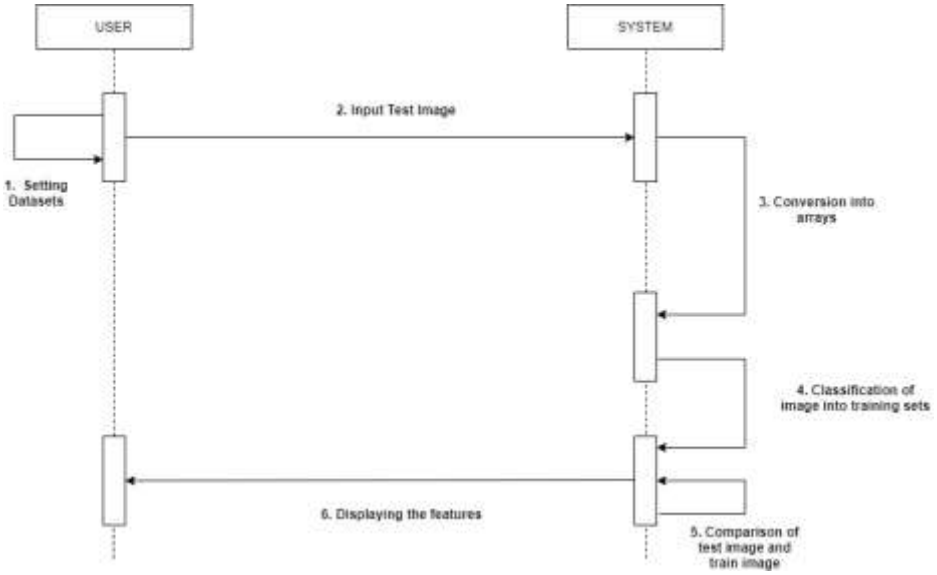

FIG.4.2.3: Sequence Diagram

5. IMPLEMENTATION

5.1 MODULES

There are 4 modules in this entire process. They are:

a. Database

b. Image pre-processing

c. CNN classification

d. Comparison of test and train images

5.2 MODULE DESCRIPTION

5.2.1 DATABASE

An image database means storing digital images in a particular location. It also means organizing photos so that they can be shared, accessed quickly and easily. We have taken large number of paddy leaf images into datasets. The size of the images taken is 256*256 pixels. There are different features like shape, color, dullness etc which are taken into consideration

FIG.5.2.1: Images of paddy leaves taken as datasets

5.2.2 IMAGE PRE-PROCESSING

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display extracted information at the end.

Using the image processing technique, we take the test images from the unhealthy plant and also along with these we train the images from the dataset so that in the pre-processing stage the features are properly extracted from the images. Some of the basic steps involved in image processing are Acquisition, Enhancement, Restoration, Compression and Segmentation.

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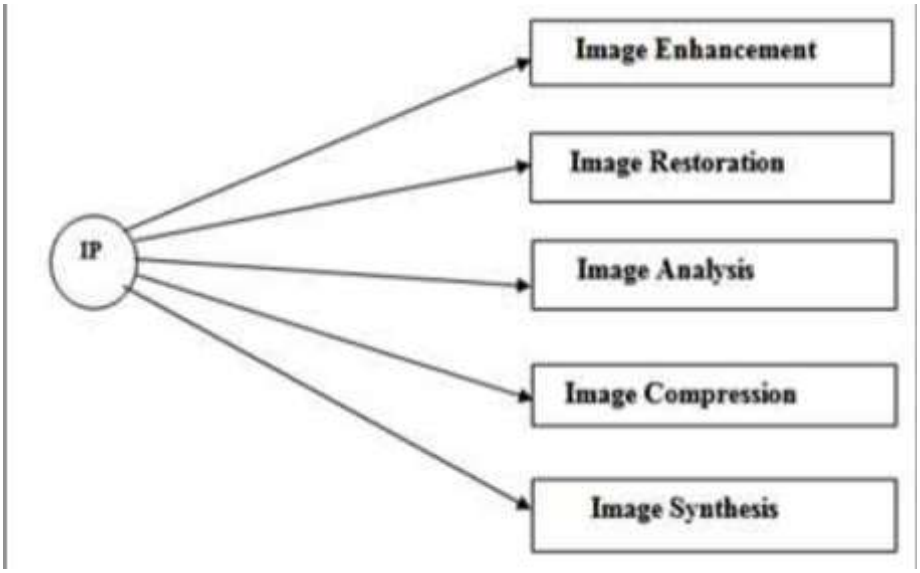

FIG.5.2.2: Image processing analysis

5.2.3 CNN CLASSIFICATION

A Convolutional Neural Network (CNN) is a powerful machine learning technique from the field of deep learning. CNNs are trained using large collections of diverse images. From these large collections, CNNs can learn rich feature representations for a wide range of images. This is one of the best techniques used for feature extraction.

After the segmentation of image into clusters the CNN classification of these clusters happen and we get different images like black and white image, query image and also the segmented image. So once these images are formed the area affected more by the disease can be easily visible and then can be tested properly and accurately.

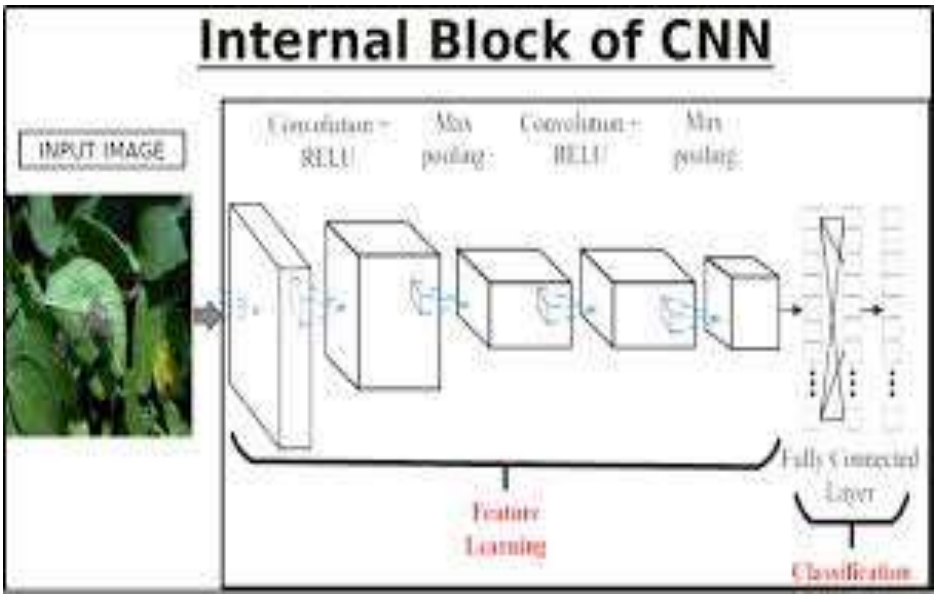

FIG.5.2.3: Internal CNN classification of the input

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5.2.4 COMPARISION OF TEST AND TRAIN IMAGES

The final stage of the process is finding whether the plant is healthy or not healthy. If there are any defects found in the image then the output will be given as yes along with the remedies to be followed for eradicating the disease. This is happened when the both test and train images are brought together and are compared.

The accuracy of the problem found is more when this is executed. This comparison of the both test and train images is important because to classify the images and extract the features very accurately. The train images consist of all the possible features and so the evaluation can be done at a proper stage. These training module images are stored permanently for the further experiments also. This is one of important thing developed in this project.

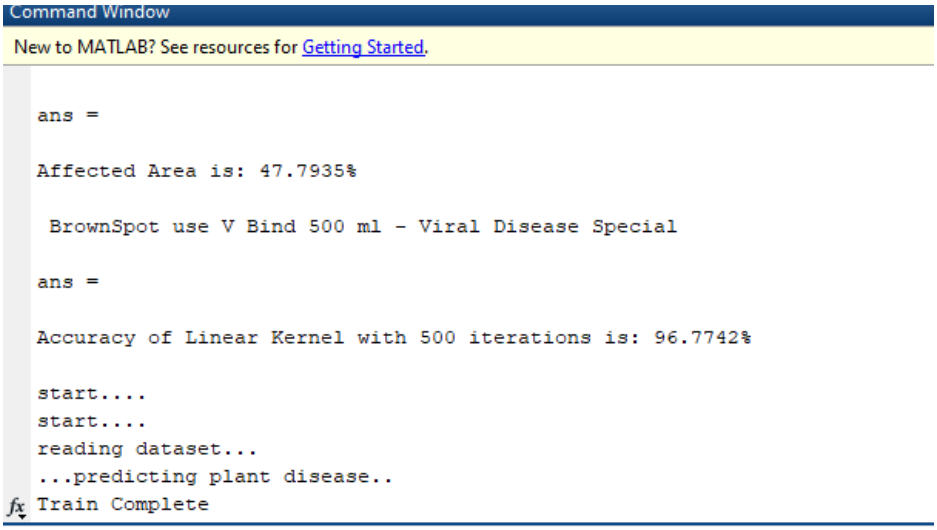

FIG.5.2.4: Sample output displayed in the Matlab software

5.3 CODE

```
66close all
clear all
clc
%% Project Title: Paddy Leaf Disease Detection
  Detect,
Predict_disease_CNN,
while (1==1)
    choice=menu('Paddy Leaf Disease Detection','..... prediction.....','..... CNN.....','..... please stop.....');
```

```
if (choice==1)
   %% Image Read
   xx = 1;
   for k=1:4
      [filename, pathname] = uigetfile({'*.*';'*.bmp';'*.jpg';'*.gif'}, 'Pick a Leaf Image File');
      I = imread([pathname,filename]);
      I = imresize(I,[256,256]);
      [I3,RGB] = createMask(I);
      seg_img = RGB;
    img=rgb2gray(seg_img);
      glcms = graycomatrix(img);


      stats = graycoprops(glcms,'Contrast correlation energy homoginity');
      Contrast = stats.Contrast;
      Energy = stats.Energy;
      Homogeneity = stats.Homogeneity;
      Mean = mean2(seg_img);
      Standard_Deviation = std2(seg_img);
      Entropy = entropy(seg_img);
      RMS = mean2(rms(seg_img));
      %Skewness = skewness(img)
      Variance = mean2(var(double(seg_img)));
      a = sum(double(seg_img(:)));
      Smoothness = 1-(1/(1+a));
      % Inverse Difference Movement
      m = size(seg_img,1);
      n = size(seg_img,2);
      in_diff = 0;
      for i = 1:m
         for j = 1:n
            temp = seg_img(i,j)./(1+(i-j).^2);
            in_diff = in_diff+temp;
         end
      end
      IDM = double(in_diff);
```

```
1200
        ff = [Contrast,Energy,Homogeneity, Mean, Standard_Deviation, Entropy, RMS, Variance, Smooth-
ness, IDM];
        if k==1
            Train_Feat = ff;
        else
            Train_Feat = [Train_Feat;ff];
        end
        if k<10 && k>1
            xx = [xx;1];
        elseif k>1
            xx = [xx;2];
        end
        Train_Label = xx.';
        Train_Label = transpose(xx);
    end
    disp('Train Complete');
end
if (choice==2)

    [filename, pathname] = uigetfile({'*.*';'*.bmp';'*.jpg';'*.gif'}, 'Pick a Leaf Image File');
    I = imread([pathname,filename]);
    I = imresize(I,[1000,260]);
    figure, imshow(I); title('Query Leaf Image');


    %% Create Mask Or Segmentation Image
    [I3,RGB] = createMask(I);
    seg_img = RGB;
    figure, imshow(I3); title('BW Image');
    figure, imshow(seg_img); title('Segmented Image');
    %% Feature Extraction
    % Convert to grayscale if image is RGB
    img = rgb2gray(seg_img);
    %figure, imshow(img); title('Gray Scale Image');
    % Create the Gray Level Cooccurance Matrices (GLCMs)
    glcms = graycomatrix(img);
    % Derive Statistics from GLCM
```

```
stats = graycoprops(glcms,'Contrast Correlation Energy Homogeneity');

Contrast = stats.Contrast;
Energy = stats.Energy;
Homogeneity = stats.Homogeneity;
Mean = mean2(seg_img);
Standard_Deviation = std2(seg_img);
Entropy = entropy(seg_img);
RMS = mean2(rms(seg_img));
%Skewness = skewness(img)
Variance = mean2(var(double(seg_img)));
a = sum(double(seg_img(:)));
Smoothness = 1-(1/(1+a));
% Inverse Difference Movement
m = size(seg_img,1);
n = size(seg_img,2);
in_diff = 0;
for i = 1:m
   for j = 1:n
      temp = seg_img(i,j)./(1+(i-j).^2);
      in_diff = in_diff+temp;
   end
end
IDM = double(in_diff);

feat_disease = [Contrast,Energy,Homogeneity, Mean, Standard_Deviation, Entropy, RMS, Variance, Smoothness, IDM];
%% SVM Classifier
% Load All The Features
%load('Training_Data.mat')
% Put the test features into variable 'test'
test = feat_disease;
% result = multisvm(Train_Feat,Train_Label,test);
 %  disp(result);

end
if (choice==3)
   close all;
```

```
1202
        return;
    end
end
```

6. SCREENSHOTS

6.1 EXECUTION

Step 1:

When a image is taken from the database as an input the first thing it undergoes is to form clusters within itself. Then according to the clusters formed we can select anyone from it for the identification.

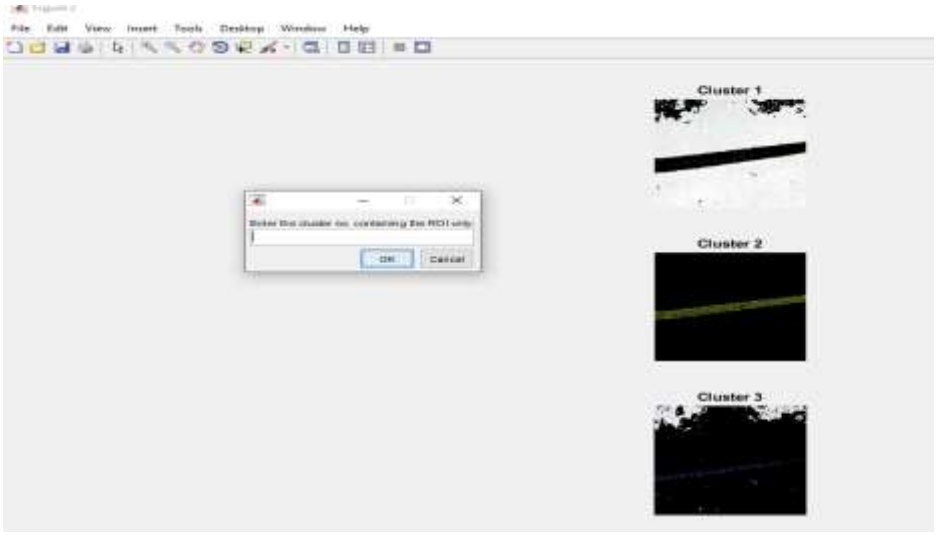

FIG.6.1.1: Image representing the no. of clusters formed from the test image

Step 2:

Once after selecting the cluster we need to check for the disease, we get a dialog box which displays the disease found and also the main remedy to be followed in order to eradicate the disease from that affected part of the paddy crop.

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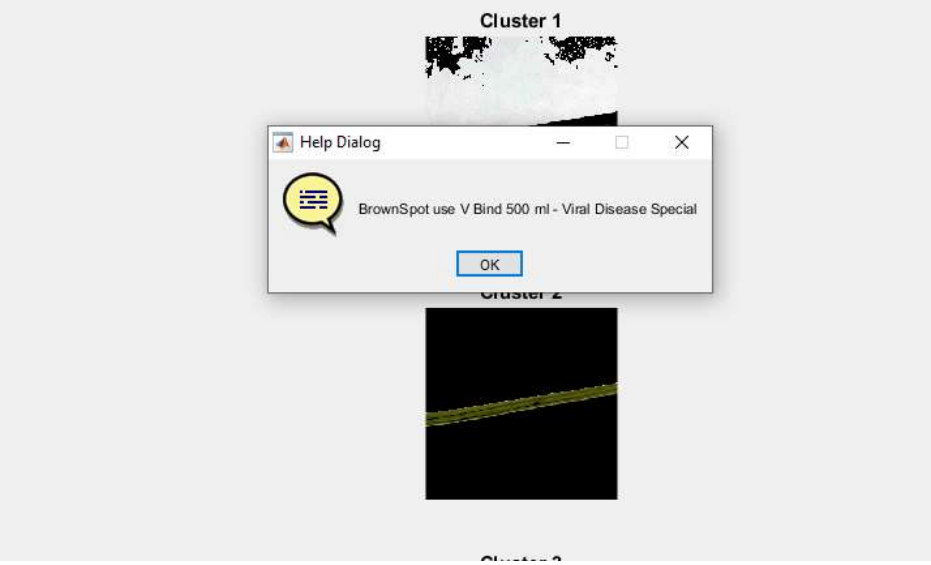

FIG.6.1.2: Disease and remedies identification

Step 3:

To find out the paddy crop disease as mentioned above, along with the test input image we also train the rest images present in the database. So in order to train the database present we are using the help of CNN classification. Once you select the images from the database, a dialogue appears which consists of Prediction, CNN Classification and Stop.

Prediction is the option used for finding out the disease from a particular image from the database by comparing both test and train images and display the output. CNN classification is the option used for selecting the database and start training it for the help of features extraction. Stop is the option used to end the process.

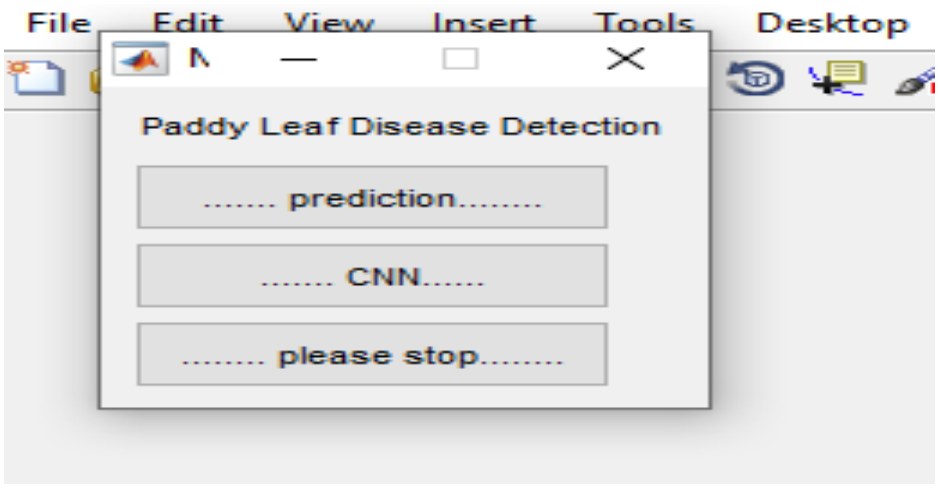

FIG.6.1.3: Dialogue box displaying various operations

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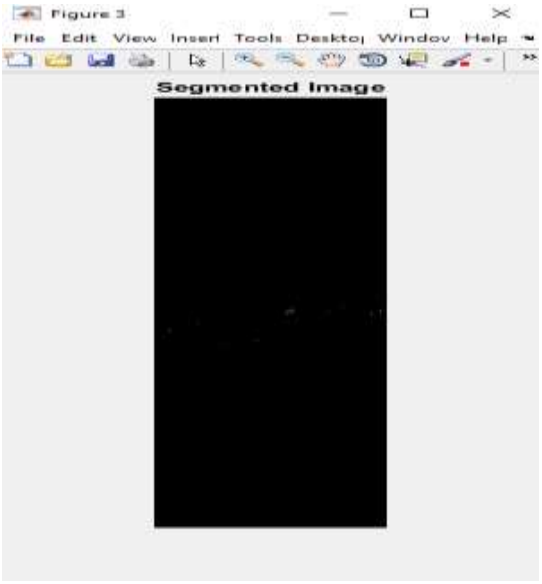
Step 4:

After the training of the database, when both the test and train images are formed there is a comparison between those train images and the cluster which is been selected from the test image. Then we can see that there are three different images formed which are segmented image, Black/White image and Query Leaf image.



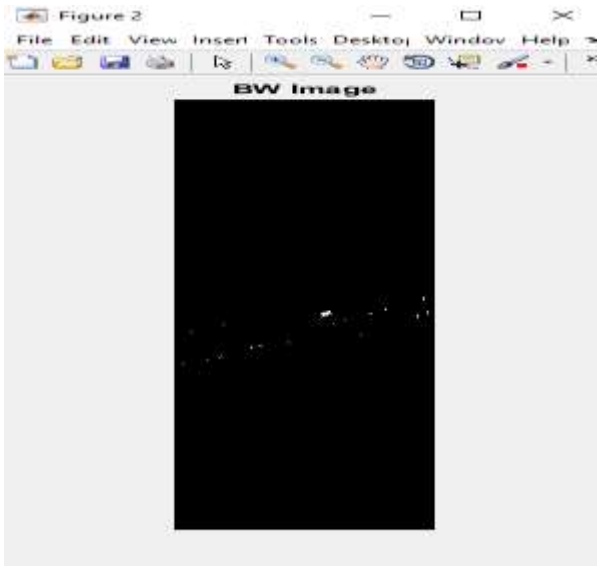


FIG.6.1.4.a: Segmented Image FIG.6.1.4.b: Black/White image

FIG.6.1.4.c: Query Leaf image

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Step 5:

This is the final step and it contains the total output of the entire process. Here the process stops and then the accuracy, disease name, remedies to be followed and also amount of the area which is affected is displayed in the command window of the Matlab software.

FIG.6.1.5: Final output

Step 6:

We have taken around 400 images for constructing this system. We have collected all different types of paddy crop images possible from the internet. The size of every image size is 256*256. Below mentioned are the some of the images which are taken and kept in the database.

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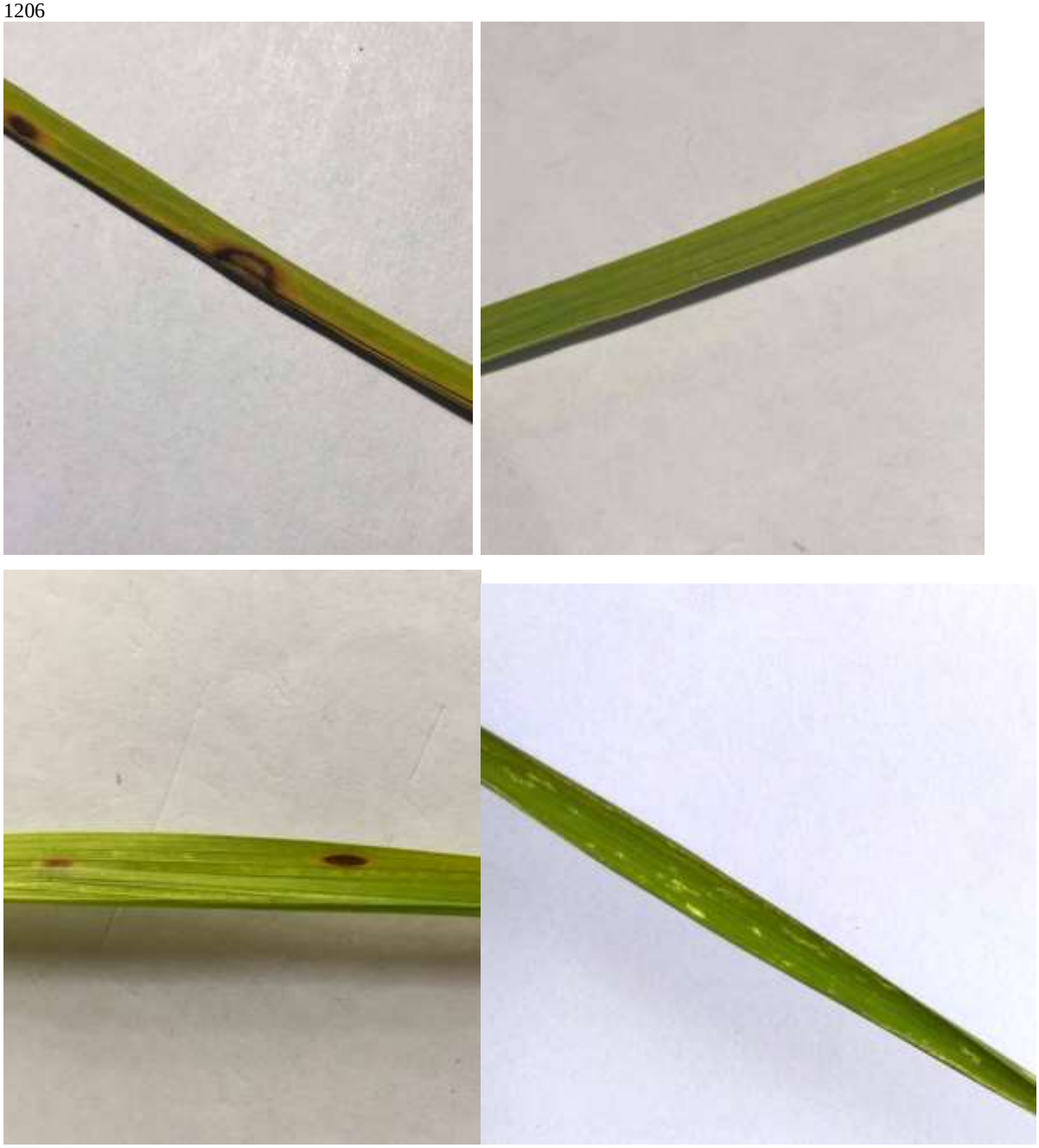

FIG.6.1.6: Different images of paddy crop

7. CONCLUSION

The proposed system was developed taking in mind the benefits of the farmers and agricultural sector .The developed system can detect disease in paddy plant and also provide the remedy that can be taken against the disease. By this we can get proper knowledge of the disease and the remedy can be taken for improving the health of the plant .The proposed system is based on python and gives an accuracy of around 89%.The accuracy and the speed can be increased by use of GooglesGPU for processing. The system can be installed on Drones so that aerial surveillances of crop fields can be done.

8. FUTURE ENHANCEMENT

This project has been developed with a less cost and so can be available at the feasible rate to the farmers or agricultural surveyors in the future. This system has been done with the help of python and gives the accuracy nearly to 96%. For the further years to come, if this system is installed along with drones and aerial surveillance can be done. This way we can get a clear picture of the leaves of paddy crop and also can do the work very easily with no extra money and workforce needed. We can also teach this methodology to people easily as most of it is done by machines and software itself.

9. REFERENCES

1. Cui D., Zhang Q., Li M., Hartman G L. and Zhao Y, Image Processing Methods for Quantitatively Detecting Soybean Rust from Multi-spectral Images, Biosystems engineering, Vol.107, Issue.3, 2010, pp.186-193.

2. Bhumika S.Prajapati, Vipul K.Dabhi Harshadkumar, B.Prajapati, “A Survey on Detection and Classification of Cotton Leaf Diseases”, International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT) – 2016.
3. Kholis Majid, Yeni Herdiyeni, Annu Rauf, “IPedia: Mobile Application For Paddy Disease Identification Using Fuzzy Entropy And Probabilistic Neural Network”, ICACSIS, 2013.

4. Vibhute A. and Bhode S K, Applications of Image Processing in Agriculture: A Survey, International Journal of Computer Applications, Vol. 52, Issue. 2, August 2012, pp.34-40.

5. Barbedo J C A, Digital Image Processing Techniques for Detecting, Quantifying and Classifying Plant Diseases, Springer Plus, Vol.2, Issue.660, 2013, pp.1-12.

6. Auzi Asfarian, Yeni Herdiyeni, Aunu Rauf, Kikin Hamzah Mutaqin, “Paddy Diseases Identification With Texture Analysis Using Fractal Descriptors Based On Fourier Spectrum”, International Conference

On Computer, Control, Informatics And Its Applications,2013.S.A. Ramesh Kumar, K.Ramesh Kumar, a Study on Paddy Crops Disease Prediction Using Data

1. Mining Techniques, International Journal of Data Engineering (IJDE), Singaporean Journal of Scientific Research (SJSR), Vol.7, No.1, Pp. 336- 347, 2015.

7. P.Revathi, M.Hemalatha, "Advance Computing Enrichment Evaluation of Cotton Leaf Spot Disease Detection U sing Image Edge detection", ICCCNT'12.

8. Malvika Ranjan, Manasi Rajiv Weginwar, NehaJoshi, Prof.A.B. Ingole, "detection and classification of leaf disease using artificial neural network", International Journal of Technical Research and Applications, 2015.

9. Heeb Al Bashish, Malik Braik, and Sulieman Bani-Ahmad, "A Framework for Detection and Classification of Plant Leaf and Stem Diseases", IEEE 2010.

10. Y.Sanjana, AshwathSivasamy, SriJayanth, "Plant Disease Detection Using Image Processing Techniques",International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, May 2015.

11. Jundare Manisha, Jundare Pallavi, Jundare Pragati, Prof. C.S.Aryan, "Plant Disease Detection and its Treatment using Image Processing" International Journal.

12. Prakash M. Mainkar, Shreekant Ghorpade, Mayur Adawadkar, "Plant Leaf Disease Detection and Classification Using Image Processing Techniques" International Journal of Innovative and Emerging Research in Engineering e-ISSN: 2394 – 3343 p-ISSN: 2394 – 5494.

13. R. Mrunalini, developer of an application of K-means clustering and artificial intelligence in pattern recognition for crop diseases, 2011.

14. Prajapati, H. B., Shah J. P. & Dhabi V. K. (2017). Detection and classification of rice plant diseases.

15. S. Raj Kumar, S. Sowrirajan, "Automatic Leaf Disease Detection and Classification using Hybrid Features and Supervised Classifier", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 5, Issue 6, 2016.