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PADDY LEAF DISEASE DETECTION USING CNN

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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: *Plant diseases, defense mechanism, Convolution Neural Network (CNN)*

I. 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.

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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 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.

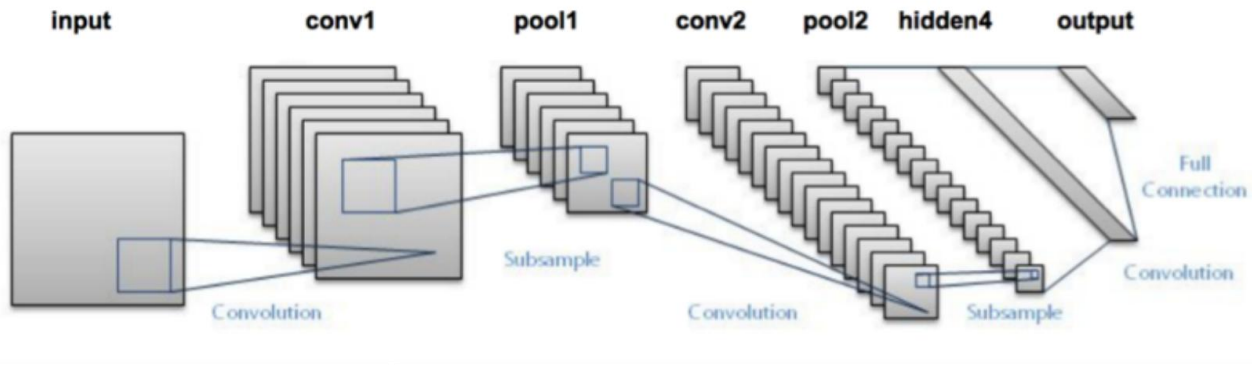

FIG.1: Convolutional

comfortable approach to help the farmers in preventing their crop from destruction.

II. 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.

BhumikaS.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.AnupVibhute 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.

AuziAsfarian 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.

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.

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

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.

IV. DESIGN

4.1 METHODOLOGY

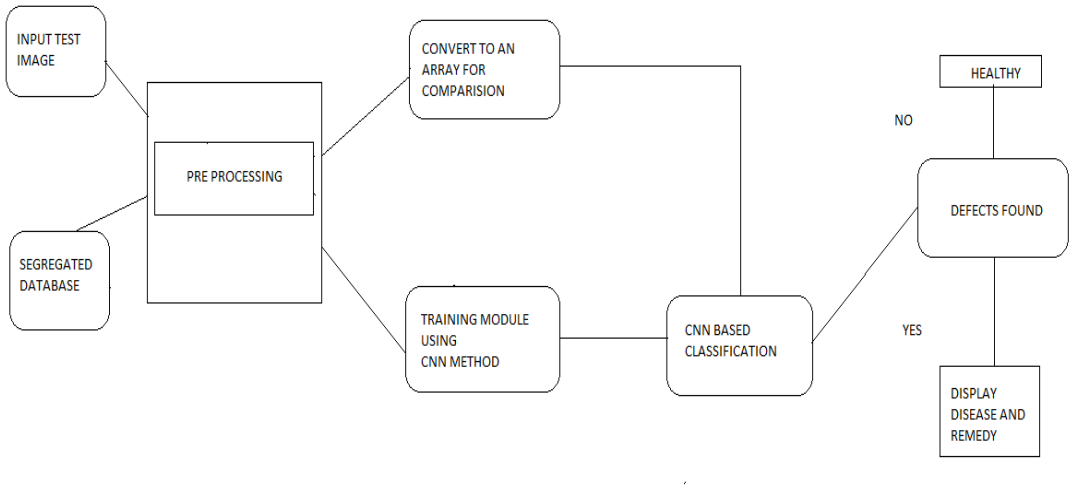

FIG.4.1: Methodology of the proposed system

V. IMPLEMENTATION

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

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.

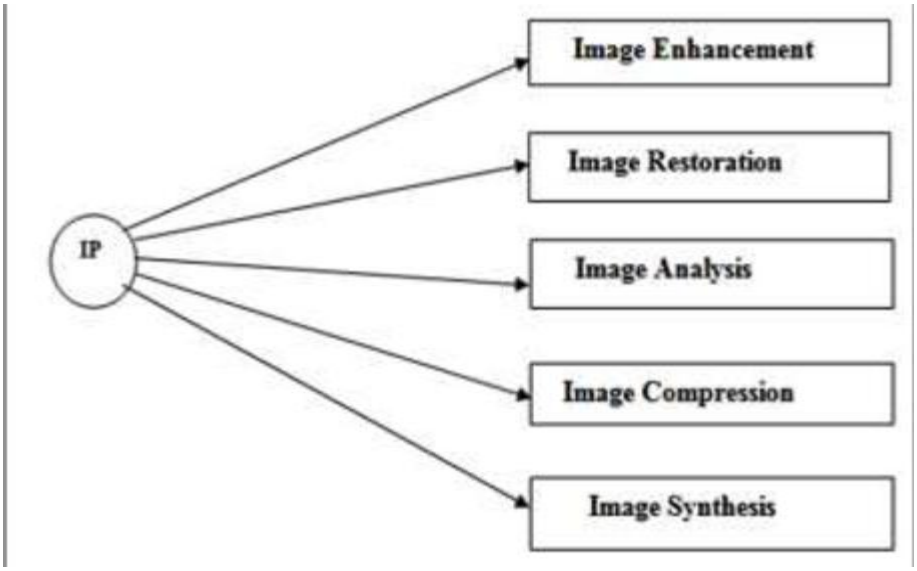

FIG.5.2.2: Image processing analysis

VI. 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.

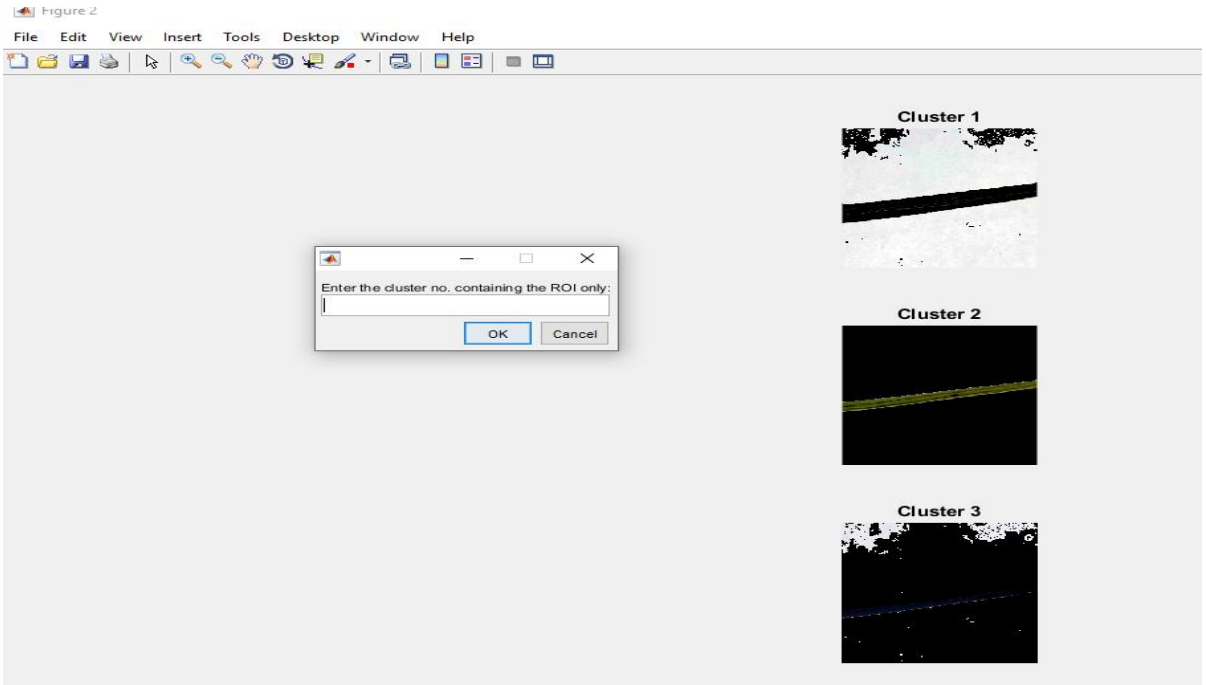

FIG.6.1.1: Image representing the no. of clusters formed from the test image

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.

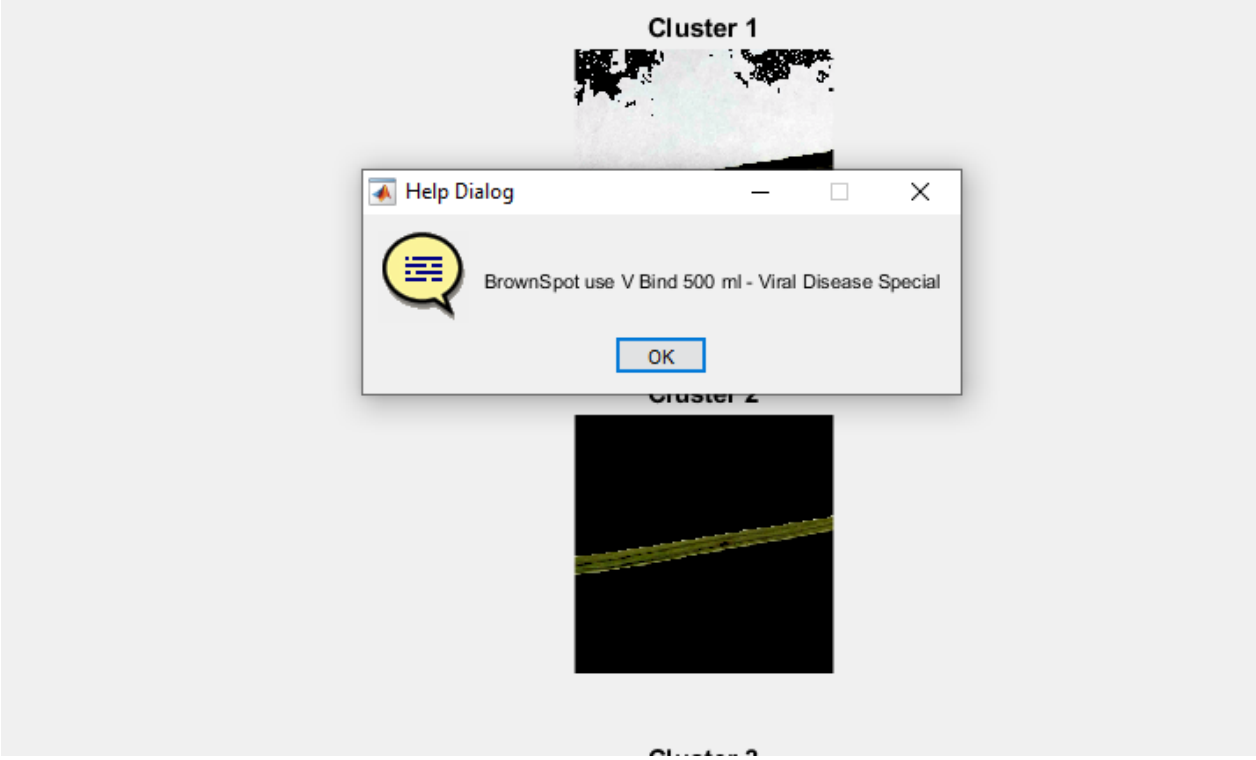

FIG.6.1.2: Disease and remedies identification

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.

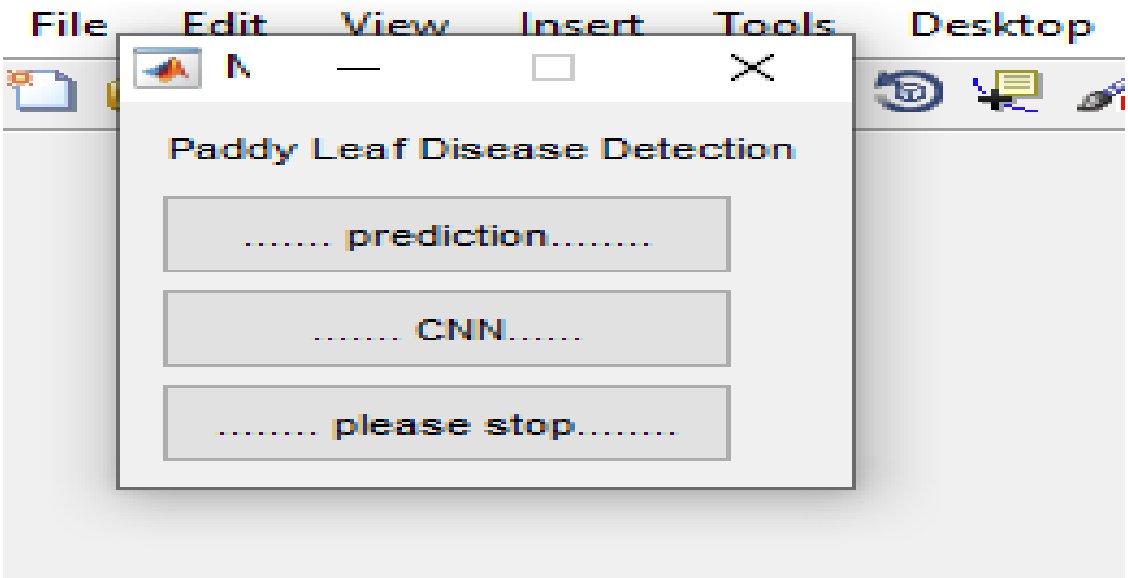

FIG.6.1.3: Dialogue box displaying various operations

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.

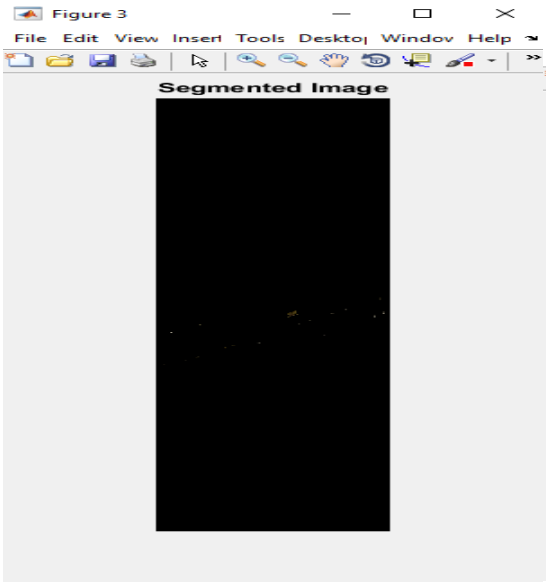

FIG.6.1.4.a: Segmented Image

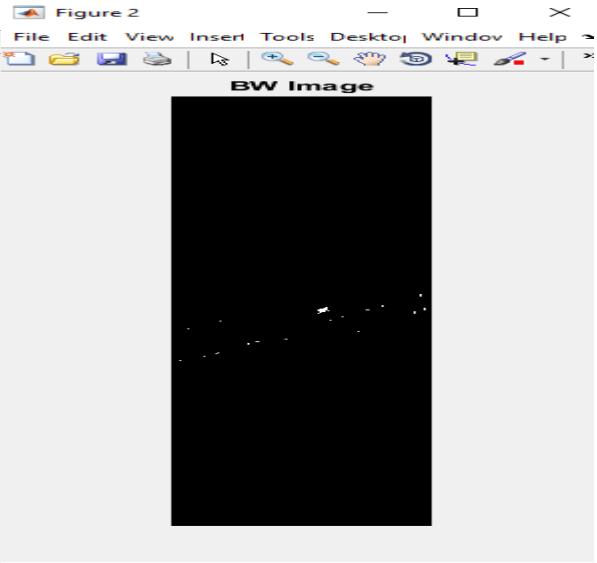

FIG.6.1.4.b: Black/White image

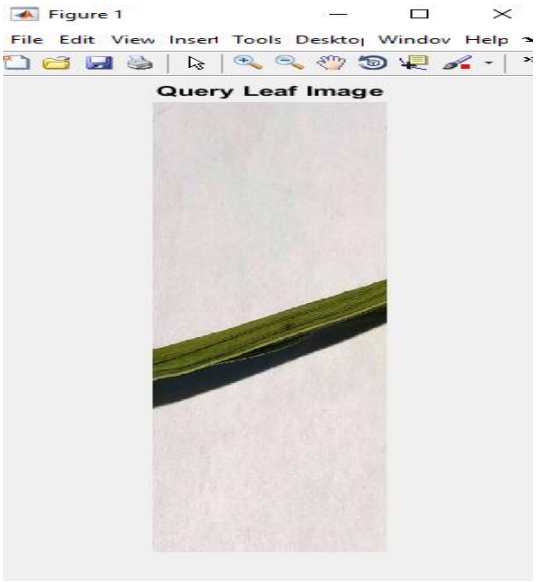

FIG.6.1.4.c: Query Leaf image

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.

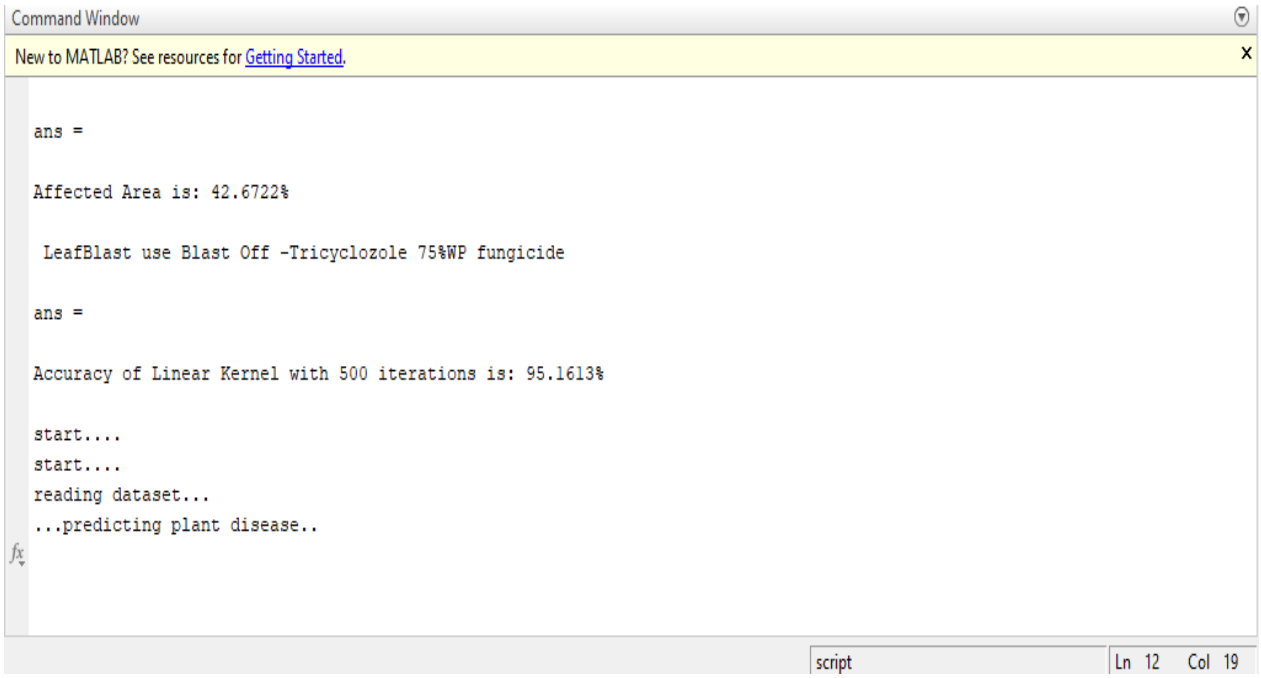

FIG.6.1.5: Final output

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.

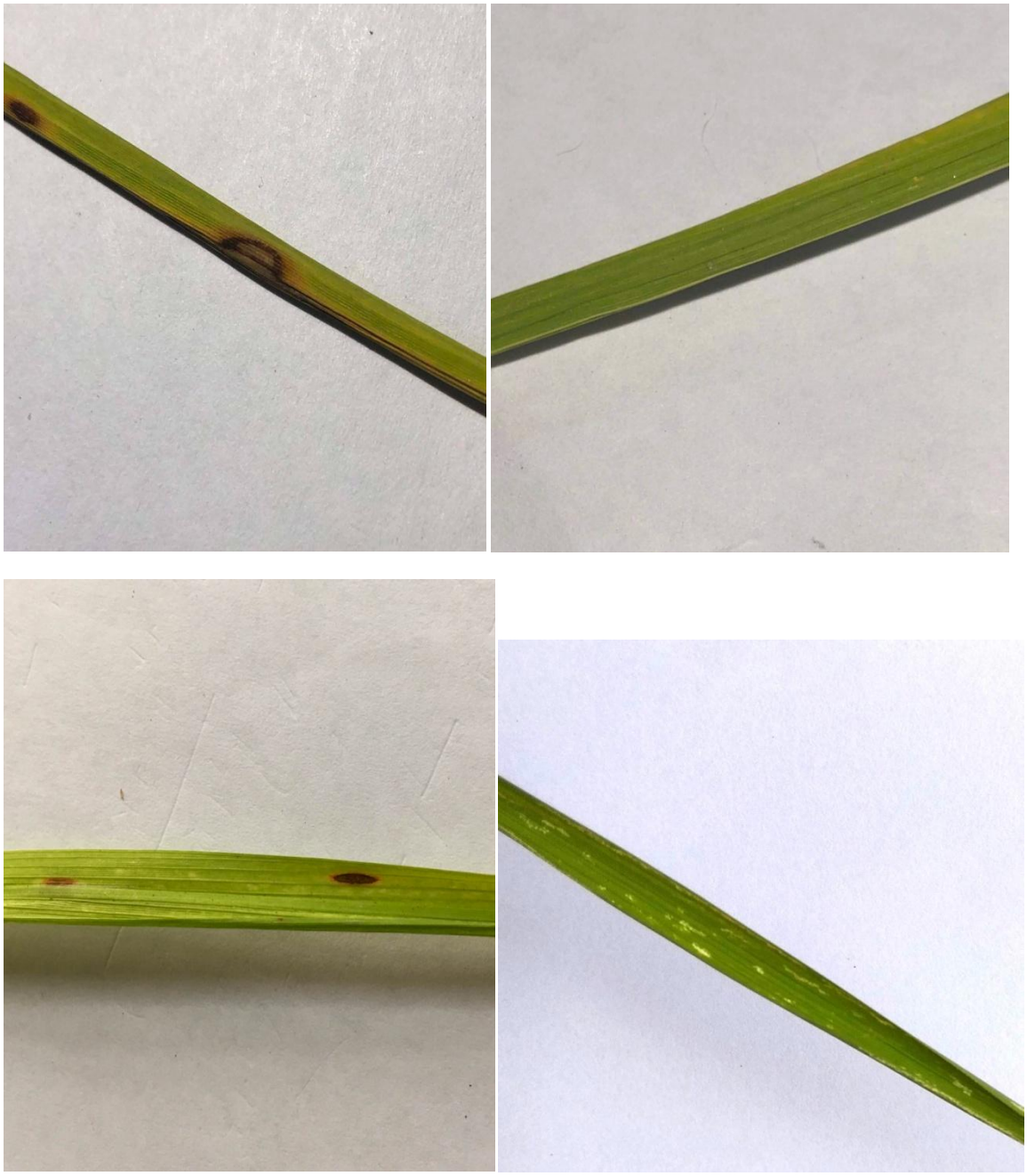

FIG.6.1.6: Different images of paddy crop

VII. 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.

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. BhumikaS.Prajapati, Vipul K.DabhiHarshadkumar, 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, YeniHerdiyeni, 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. AuziAsfarian, YeniHerdiyeni, Aunu Rauf, KikinHamzahMutaqin, "Paddy Diseases Identification With Texture Analysis Using Fractal Descriptors Based On Fourier Spectrum", International Conference On Computer, Control, Informatics And Its Applications,2013.

7. S.A. Ramesh Kumar, K.Ramesh Kumar, a Study on Paddy Crops Disease Prediction Using Data

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

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

9. MalvikaRanjan, 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.

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

11. 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.

12.Jundare Manisha, JundarePallavi, JundarePragati, Prof. C.S.Aryan, “Plant Disease Detection and its Treatment using Image Processing” International Journal.

13. Prakash M. Mainkar, ShreekantGhorpade, MayurAdawadkar, ”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.

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

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

16. 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.

17. Surbhi Jain, JoydipDhar, “Image based search engine using deep learning”, 2017 10th International conference on contemporary computing(IC 3), August 2017.