

Identification of Plant Disease Using Image Processing Techniques

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Abstract: This research work introduces and conditionally look over a software based method for evaluating plant diseases using image processing techniques. Analysis of plant characteristics or the unusual appearance of plant leaves referred the observable disorder in plant leaves i.e. Plant leaves is infected by some disease. Presently crops or we can say plants showing very unusual characteristics. Damage by insects and different other types of diseases. Therefore, detection of such diseases is very necessary at the early stages. Studies show classification of such diseases using different classifiers viz. Neural Network, Support Vector Machine, and Known Nearest Neighbor. Around 9 different types of plant leaves are classified as healthy or diseased using these classifiers.

Keywords: Neural Networks (ANNs), Support Vector Machine (SVM), Known Nearest Neighbor(k-NN).

I. INTRODUCTION

India is an agricultural country wherein most of the population depends on agriculture. Research in agriculture is aimed towards increase of productivity and food quality at reduced expenditure, with increased profit. Agricultural production system is an outcome of a complex interaction of soil, seed, and agro chemicals. Vegetables and fruits are the most important agricultural products. In order to obtain more valuable products, a product quality control is basically mandatory. Many studies show that quality of agricultural products may be reduced due to plant diseases. The objective of proposed work is to implement a "Plant Diseases Identification Techniques using Image Processing".

II. BACKGROUND

Diseases are the destruction to the development of plants. So, farmers require persistence supervision of specialists for healthy crop which may be quite costly and needed large amount of time for proper analysis. Therefore, there is a need of quick, cheap, and a precise method, which automatically evaluates the diseases from the signs of illness that appear on the plant leaves. Which also have a great realistic significance.

I am leaving in a banana belt. Production of banana is more here so it is necessary to monitor the diseases in banana crop time to time so that production does not affect the productivity and quality of crop. But, monitoring of single plant leaves is not necessary. So, this study focuses on identification of diseases in 9 different types of plant leaves which can be

extended in future.

III. ABOUT PROJECT

This research focuses on development of a simple plant leaves disease detection system that provides betterment in agriculture. A bit previous knowledge of any crop health and disease exposure can provide the command on disorder through suitable planning and by applying proper methodology. As India's most of the population depends on Agriculture so for the betterment of the crop and for helping farmer's. This technique will help in the improvisation and productivity of crops. It includes several steps viz. image acquisition, image pre-processing, features extraction and neural network based classification.

Basic system flow or system design of "Identification of Plant Diseases Using Image Processing Techniques" is shown below -

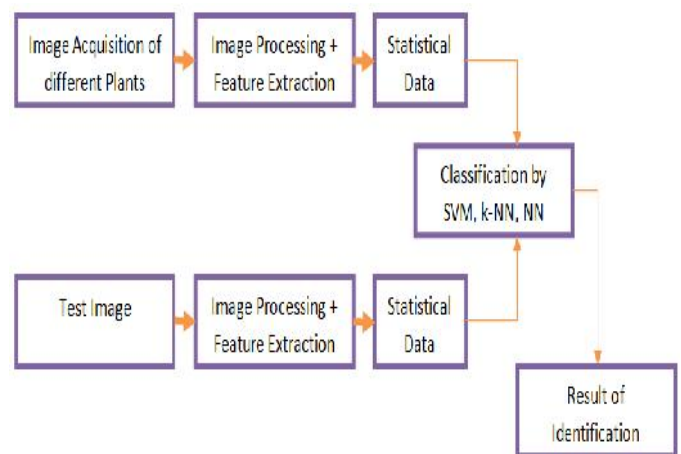


Fig. 1- Basic Methodology

IV. PERFORMANCE ANALYSIS

As this research is focused on plant disease identification around 9 types of plant leaves are observed those 9 types of plant leaves considered for analysis are – Banana, Lemon, Cotton, Rose, Papaya, Mango, Okra, Hibiscus, and Coconut.

Table 4.1 specify the number of images of Diseased and Healthy leaves of different plants in database to train Neural Network –

Table 4.1 – No. of Leaves Taken from Each type of Plant

Sr. No.	Leaf Type	No. of Diseased Leaves	No. of Healthy Leaves
1.	Banana	60	40
2.	Lemon	20	10
3.	Cotton	20	10
4.	Okra	20	20
5.	Coconut	20	20
6.	Hibiscus	20	20
7.	Mango	20	20
8.	Papaya	20	20
9.	Rose	20	20

This can be processed as –

1. Capture image of the diseased leaf of plants
2. Before that maintain the database of images of some diseased and healthy plants leaves of the same plant to train Neural Network
3. Now, Start Matlab
4. Initially train the Neural Network
5. Select the Image of the leaf to identify whether leaf is healthy or diseased using support vector machine i.e. SVM classifier
6. K-NN Classifier identify the diseased affecting the plant leaves
7. Finally, Neural Network tells the preciseness of the device.

Let us take an example-

Consider leaf of banana. Banana is one of the most fascinating and important of all crops. It is a large mono-cotyledonous herb that originated in Southeast Asia.

A leaf spot disease presents in banana plant is one of the very severe disorder which quickly spread and can harm the whole banana crop. Initial symptoms appear in the form of light yellowish spots on the leaves.

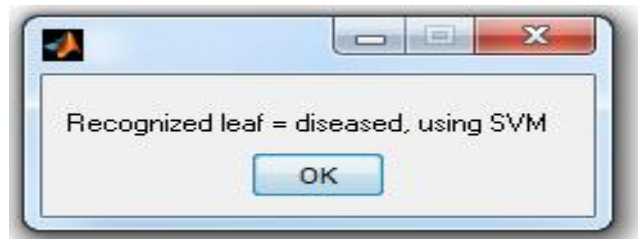
Rainfall, moisture and rise in temperature helps in the spreading of this disease in whole banana crop. Different climate situations promote this disease one of those is the rainy season with temperature more than 21°C.



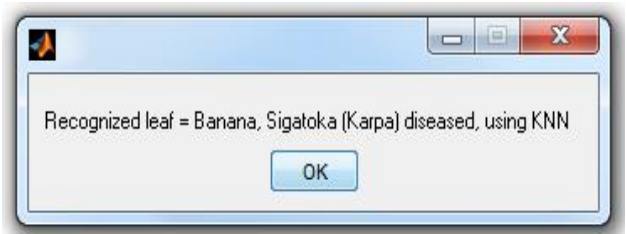
Fig. 2 – Diseased Banana Leaf

Follow the above steps i.e.

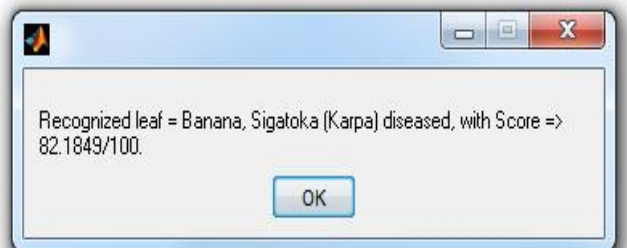
1. Capture image of the plant leaf which we have to test.
2. Before that maintain the database of images of banana leaves, some diseased and some healthy to train Neural Network
3. Now, Start Matlab
4. Initially train the Neural Network
5. Select the Image of the leaf to identify whether leaf is healthy or diseased using support vector machine i.e. SVM classifier.

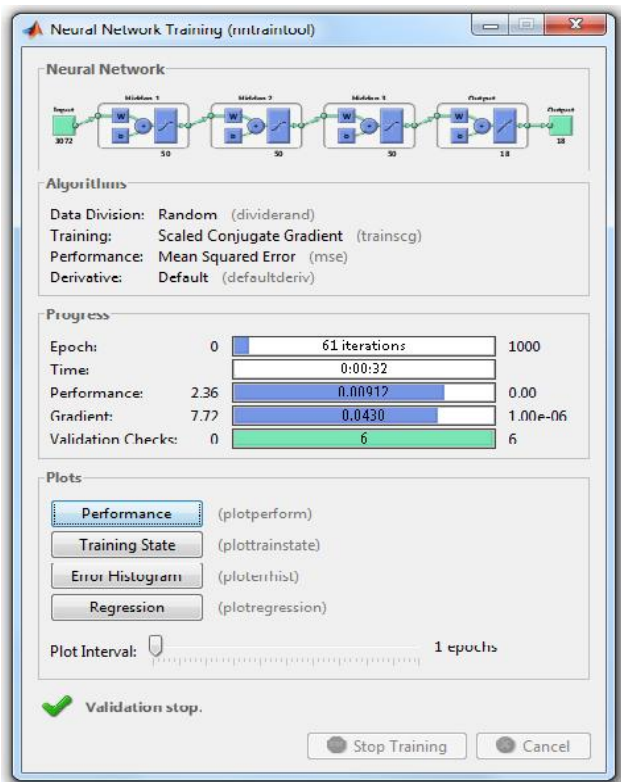


6. K-NN Classifier identify the diseased affecting the plant leaves.

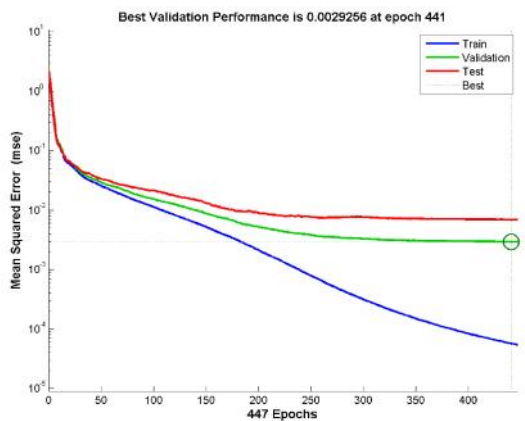


7. Finally, Neural Network tells the preciseness of the device.

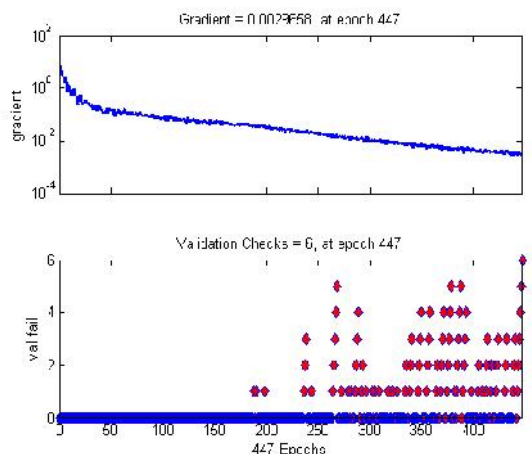




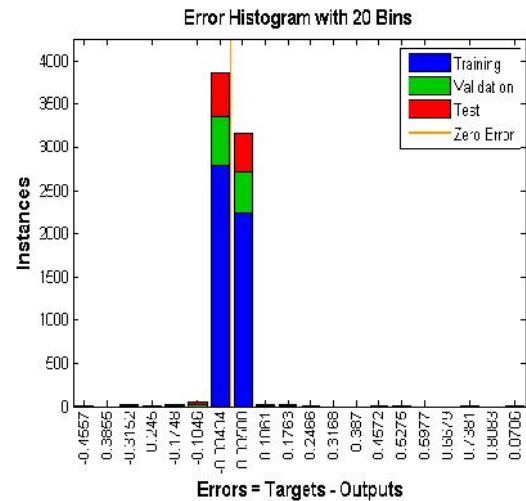
Plots –
Graph 1 – Performance



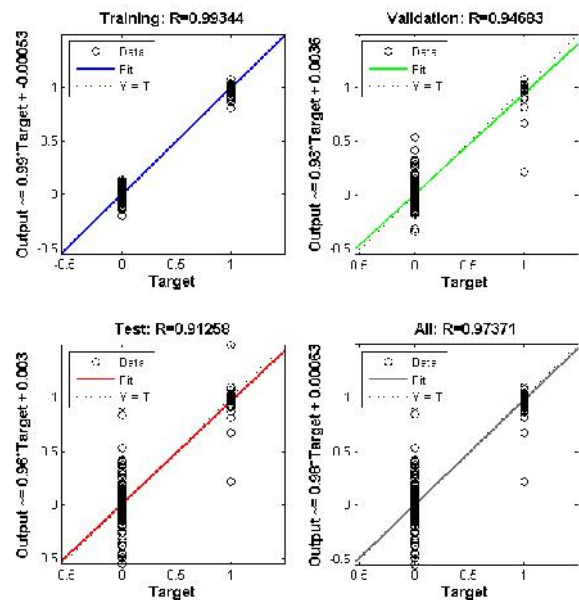
Graph 2 – Training State



Graph 3 – Error Histogram



Graph 4 – Regression



The findings indicate that the proposed feature extraction algorithm has a great potential for feature representation of leaf images in this classification task. Finally, we computed for 9 types of leaves and the results are promising.

Table 4.2 shows the result of the processing of the images of diseased plant –

Table 4.2 - Result of the Processing of the Images of Diseased Plant

Sr. No.	Leaf Type	Expected Disease	Actual Diseases	Success Rate
1.	Banana	Sigatoka	Sigatoka	100%

2.	Lemon	Scab	Scab	99.41%
3.	Cotton	Bronze	Bronze	96.96%
4.	Okra	Powdery Mildew	Powdery Mildew	93.59%
5.	Coconut	Gray Leaf Blight	Gray Leaf Blight	90%
6.	Hibiscus	Leaf Spot Disease	Leaf Spot Disease	90%
7.	Mango	Powdery Mildew	Powdery Mildew	90%
8.	Papaya	Ring Spot Diseases	Ring Spot Diseases	90%
9.	Rose	Black Spot Disease	Black Spot Disease	90%

V. RESULTS

This is one of the easiest methods to monitor crops due to this detection and curing of diseases can be possible at early stage. Neural Network efficiency is used to classify appropriately the plant is diseased or healthy. Along with that SVM and KNN gives us a confidence on the obtained results. Now, further processing is done in curing that diseased plant is taken to make it healthy again.

VI. CONCLUSION

1. Plant diseases detection at early stage by using Image processing techniques is implemented successfully
2. System performance is tested and found satisfactory in terms of accuracy and efficiency for both real time as well as database images
3. Classification of nine plants images by using three classifiers SVM, k-NN and Neural Network (NN) is done.
4. This technique is used to analyze the healthy and diseased plants leaves.
5. This system has Accuracy between 90% - 100% which made the system most accurate and precise method for identification of plant diseases.
6. This system also have feature to process real time images. So, monitoring of distant images can be possible.

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Priya Soni was born on 07.03.1992. In 2013 she completed her Graduation (B.E) with distinction at the department of Electronics & Communication of the Shri Sant Gadge Baba College of Engineering & Technology, Bhusawal. She is pursuing her Master degree in Communication. With learning on fly ability she achieved best results in whatever role she is assigned to. She is passionate about playing Badminton and know how to enjoy her life well.