

Detection and Recognition of Papaya Leaf Diseases Using Image Processing

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Abstract

Horticulture has been defined as the agriculture of plants mainly for food materials. It includes plant conservation, landscape restoration, soil management and maintenance. In this paper we are going to detect the diseases which occurs in papaya leaf because papaya is a fruit which is rich in vitamins, amino acids, carbohydrates and minerals which strengthens the bones, prevents muscle cramping and increases the energy. Papaya is gaining importance nowadays which plays an important role in horticulture because of its medicinal properties and for its rich nutrients. It has found farmers are facing many issues regarding diseases which are affecting the papaya plant so we have planned to introduce computer vision techniques which will automatically detect the infected plant in order to increase the yield and quality of the fruit. We propose a system which captures the plant and processes it using gradient anisotropic diffusion and extracts the features using GLCM from the leaf, stem and fruits and finally it classifies using extreme learning machine which recognize the disease affected in the plant..

Keywords: Anisotropic Diffusion Filter, Grey Level Co-Occurrence Matrix, Extreme Learning Machine

1. Introduction

Many diseases affect the entire plant which spoils the entire farm which in turn effects the economy. These losses can be removed by identifying the disease as earlier as possible. Identifying and detecting at earlier stage strengthens the farm and also the economy and quality of the fruit. Farmer face difficulty in identifying the diseases because they need more human intervention to reduce that we go in for smart farming [7]. In Computer vision plays an important role in making machine think and act like human. This technology uses a camera and a computer rather than using human intervention. Therefore classification of disease in plants acts as a major role. To detect a plant disease in precise primary stage, use of automatic infection identification technique is valued. Currently, a new idea of smart farming has been offered where the field conditions are measured and practical using automatic classifications.

In our work we have taken Papaya (Caricapapaya) is one of the important horticulture plant which is rich in medicinal properties and rich in nutrients [6]. The possible health benefits of consuming papaya include a reduced risk of heart disease, diabetes, cancer, aiding in digestion, improving blood glucose control in people with diabetes, lowering blood pressure, and improving wound healing. Papayas are an excellent source of vitamin C, and one single medium fruit provides 224 percent of recommended daily intake.

1.1 Challenges Faced in Analysis of Plant Diseases

Automation of classifying disease involves the input data collected from different sources. Some the challenges faced in plant disease identification are listed below

- How quality is the plant image captured
- Requires large data set

- Images consist of more noise that must be removed
- Classification done must be accurate
- Regular observation must be done.
- Classifying the type of disease places an important role.

2. Literature Survey

The related work discusses about the previous works and also converses on investigation work supported on automatic recognition and classification of plant diseases.

In [1] author addresses the problems faced by papaya plant. It mainly focusses on two challenges on is identification of the disease and another one is classification of the type of disease which is affected. This paper uses k means segmentation algorithm after segmenting it extracts the features from the segmented image and from that features it classifies whether it is affected by the disease or not using support vector machine. This model has archived 90% accuracy of classifying disease on papaya plant.

In [4] author addresses the problems faced by horticulture and focusses on grape fruit and plant. It classifies mainly on two diseases that is powdery mildew, Downey Mildew. It extracts the features of the fruit or leaf from the plant image it uses Gabor filter method and classifies based on the feature value obtained by using artificial neural network. ANN is trained by both infected and uninfected plants and from that it classifies the disease i.e powdery mildew and downy mildew.

In [2] author has addressed a structure that classifies the disease by using four modules it first adjust the intensity of the image which is going to be tested after applying histogram equalization that is given as the input for the next module i.e segmentation in that it segments the region which is affected based on the shape and color. The segmented image features are extracted these values are trained using neural network which finally classifies the disease.

In [3] author addresses the problems faced by farmers on crops. Because crops plays a vital role in agriculture which depends on the quality of the food. So this paper presents a technique which identifies and detects the plant leaf disease by using genetic algorithm.

In [5] the author uses k means clustering algorithm for segmentation of infected leaf and classification is done using support vector machine. This paper focuses only on leaf disease it does not identify the disease affected on the entire plant.

3. Papaya Diseases

Diseases in papaya is caused due to fungi, microbes, viruses and nematodes. Here we will discuss some of the common diseases which occur on papaya leaf.

3.1 Powdery Mildew

The powdery mildew disease occurs on the leaves as well as on the fruits a whitish powder layer occurs this is caused due to fungus and it causes infection to the entire plant and reduces the quality of the fruit and yield. Fig 3.1.1 shows powdery mildew in papaya.



Fig 3.1.1 Powdery Mildew

3.2 Papaya Ring Spot Disease

The papaya ring spot disease is caused by viruses it will spread from one plant to another. The early symptom which occurs on the papaya leaves which are yellow in colour and in severe case it leads to leaf distortion. The fruits with contain concentric rings and spots. The affected plant fruit will be of low quality and affects its flavour. The fig 3.2.1 shows papaya ring spot disease.

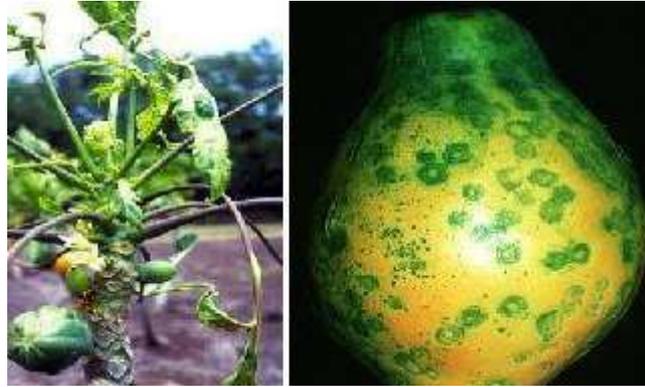


Fig 3.2.1 Papaya Ring Spot Disease

3.3 Papaya Leaf Curl Disease

The papaya leaf curl disease is transmitted by white fly it causes a severe curling and deformation of the leaves. Mostly the young leaves are affected. The affected plants shows a stunted growth with reduce fruit yield. Fig 3.3.1 shows the papaya leaf curl disease.



Fig 3.3.1 Papaya Leaf curl Disease

3.4 Leaf- Blight

The leaf blight disease causes severe damage to leaves. At earlier stage it appears as a small discoloured lesion and scatters to all the leaves. These spots become irregular in shape and appear brown in colour. Severe infections causes the whole leaf to die. It causes reduction in fruit yield. Fig 3.4.1 shows leaf blight disease.



Fig 3.4.1 Leaf Blight

4. Proposed Work

In our work we are going to identify and classify the plant disease using extreme learning machine. The papaya plant image is read and noise is removed and the intensity is equalized in the image for equalization by using the technique of anisotropic diffusion method. After equalization this image is given to the next module for segmentation where the affected region is segmented from the segmented image the feature values are extracted using GLCM and these features are trained to the classifier called extreme learning machine and finally the plant disease is identified and classified based on the disease. The proposed model is shown in figure 4.

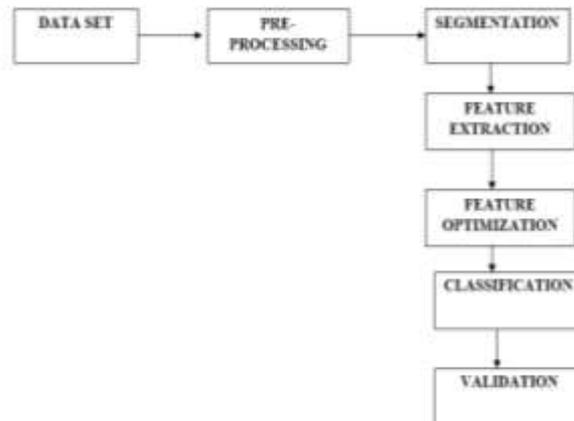


Figure 4 Architecture Diagram

4.1 Data Collection

In this section the plant images are collected from both normal and infected papaya plant leaf, stem and fruit images are collected to identify and classify the type of disease. Fig 4.1.1 shows the normal plant which is not infected and fig 4.1.2 shows the infected plant.



Fig 4.1.1 Normal Plant



Fig 4.1.2 Infected Plant

4.2 Pre-Processing

Pre-Processing is the method of removing noise from the image which improves the quality of the image. Anisotropic Diffusion Image filter removes the image noise without losing any parts of the image. Finally it returns the pre-processed image with good quality. Fig 4.2.1 shows the pre-processed image.

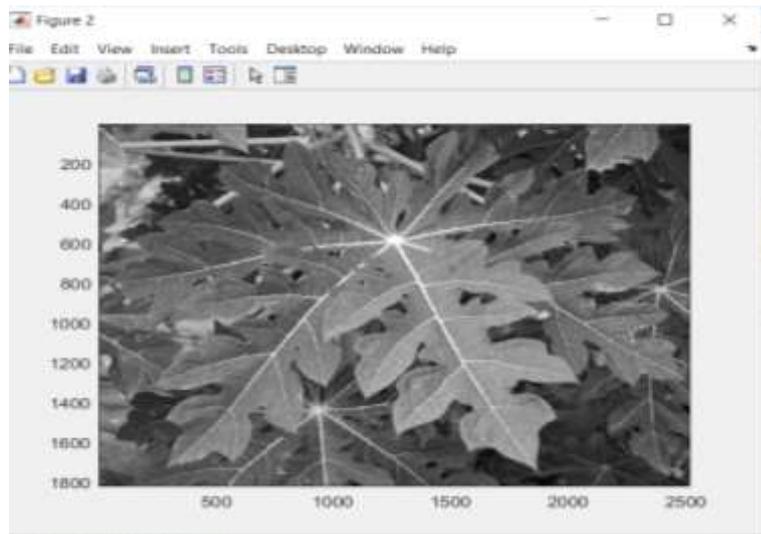


Fig 4.2.1 Pre Processed Image

4.3 Segmentation

In our work segmentation is done using the technique of region based segmentation which segments the image based on the similarity of intensity values. This method gives the exact region where the plant is affected by the disease.

4.4 Feature Extraction

From the segmented image the features are got for extracting the information for finding the plant disease. The Gray level co-occurrence matrix is used here to determine the feature values. The obtained features are contrast, correlation, energy, homogeneity these features are trained to the system for classification. Fig 4.4.1 shows the values extracted by GLCM.

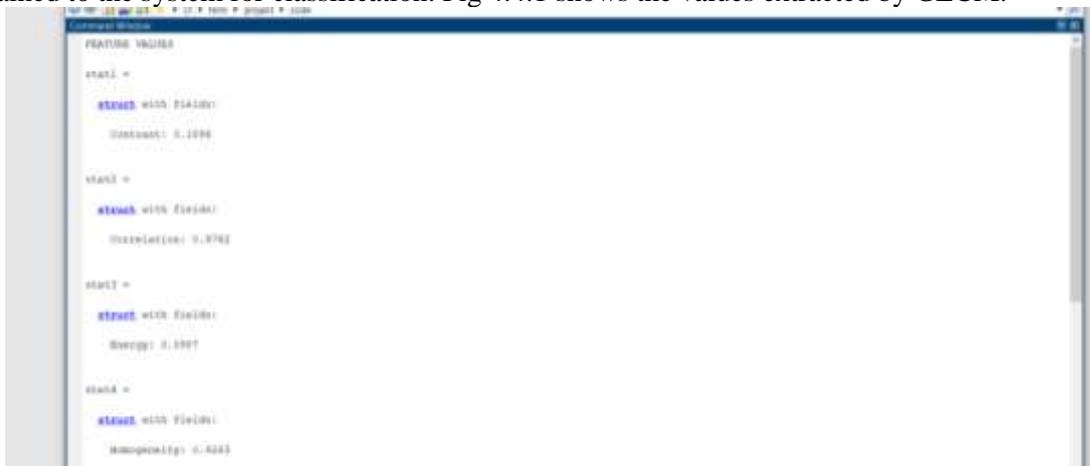


Fig 4.4.1 Feature Extracted Values

4.5 Classification

In this section the extreme learning machine is trained based on the feature values obtained from both the affected and normal plants. And from this the machine classifies whether the papaya leaf is affected or not and specifies the type of disease in it.

Extreme learning machine is a feedforward neural network with single hidden layers. It is specially designed for classification and recognition. The algorithms identifies the disease if the plant is infected.

5. Conclusion

This paper has proposed a technique for identifying and classifying papaya plant leaf diseases like powdery mildew, Papaya Ring Spot Disease, Papaya Leaf Curl Disease, Leaf-Blight using Extreme Learning machine by using feature values using GLCM and by applying segmentation and pre-processing techniques. This technique can also be used for agricultural

processing i.e for crop disease identification etc also it can be used to identify other plant diseases also occurred in other plants.

References

- [1] Md. Tarek Habib AnupMajumder, A.Z.M. Jakaria, MoriumAkter, Mohammad Shorif Uddin“Machine vision based papaya disease recognition” Journal of King Saud University – Computer and Information ScienceVolume 32, Issue 3, March 2020, Pages 300-309.
- [2] Sachin B. Jagtap, Shailesh M. Hambarde,” Agricultural Plant Leaf Disease Detection and Diagnosis Using Image Processing Based on Morphological Feature Extraction” IOSR Journal of VLSI and Signal Processing (IOSR-JVSP) Volume 4, Issue 5, Ver. I (Sep-Oct. 2014), PP 24-30.
- [3] Vijai Singh, A.K. Misra,”Detection of plant leaf diseases using image segmentation and soft computing techniques” Information Processing in Agriculture 4 (2017) 41 –49.
- [4] Sushil R. Kamlapurkar,” Detection of plant leaf disease using image processing approach” International Journal of Scientific and Research Publications, Volume 6, Issue 2, February 2016 73 ISSN 2250-3153.
- [5] Sujatha R , Y Sravan Kumar and Garine Uma Akhil,” Leaf disease detection using image processing”, Journal of Chemical and Pharmaceutical Sciences Volume 10 Issue 1.
- [6] Konstantinos P. Ferentinos,” Deep learning models for plant disease detection and diagnosis” Computers and Electronics in Agriculture 145 (2018) 311–318.
- [7] D.Femi, T.DanushChowdary, NallanukalaAnilkumar,”Early Detection Of Plant Disease Using Machine Learning”International Journal of Innovative Technology and Exploring Engineering (IJITEE) (2019) 950-952.