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Crop Leaves Disease Detection Using DLA Algorithm

S. Raja[1], Dr. C. Ashok Kumar[2]

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Abstract: The most important criteria or the factor which could reduce the overall yield loss in the agriculture is detecting the diseases present in the crop and taking evasive action to curb them at the early stage. The studies related to the plant is shown in this paper and the most common diseases that affects the crops and its leaves are analyzed and the methods to find them are showcased in this paper. The easiest and the fastest method to identify the diseases is by using image processing techniques and identify the anomaly present in the crops. Once the diseases are identified, the farmers can employ the appropriate pesticides to curb the disease at the budding stage to increase the yield and their profit. The proposed algorithm named Detect Leaf Anomaly DLA is compared with neural network to gauge its performance.

***Keywords**: Leaves Disease, Image Classification, Detect Leaf Anomaly, Neural Network*

Introduction

India is a developing country and approximately around 70% of the total population relies upon agricultural income. Most of the farmers in India have enormous scope of variety for choosing different reasonable harvests and tracking down the appropriate pesticides for plant and to increase their production. Henceforth, any disease or pest attack to their crops would lead to huge loss to them and would eventually influence the economy of the whole nation.

The leaves in the crop being the touchiest piece of crop shows symptom of the infection very early and it is imperative to analyze the leaves. The yields should be checked against sicknesses from the absolute first phase of their life-cycle to the time they are fit to be harvested.

At first, the strategy used to screen the plants from infections was the customary unaided eye perception, but this is a cumbersome process which requires lot of manual work and many experts to physically examine the agricultural fields. The current technologies are advanced enough to identify the diseases by using simple image processing techniques and moreover the time taken to identify the diseases is far less and need no manual work or experts. In the vast majority of the cases illness / side effects are seen on the leaves, stem, branches and fruits. But the symptoms of the diseases are mostly found in the leaves. Most of the farmers misses out the diseases at the early stage and this leads to a huge loss in the overall production and there by reduces the income largely.

1Research Scholar, Department of Computer and information science, Annamalai University, Tamilnadu, India – 608 002.

E-Mail : rajadeo@gmail.com

2Research Supervisor, Department of Computer and information science, Annamalai University, Tamilnadu, India – 608 002.

E-Mail : cashok1976@gmail.com

Related Works

The author Barbed cited in [1] utilizes the K-Mean segmentation to divide the leaf into four structures and then the important features are extracted from them. The extracted features are then classified using neural network and this method is almost 90% accurate in the disease detection.

Object based identification methods like SSD and DSSD can be regarded as the best methods to classify the parts or classes in the image and it comprises of two sections, namely,

1. The initial segment is the pre-processor model, which utilizes the highlight present in the features to detect the anomaly.
2. The next one is an auxiliary structure that uses multi-scale factor map to detect the anomaly present in the structure of the images [2].

Various strategies have been embraced for each kind of crop.For natural product crops, k-mean algorithm is utilized [3], surface elements have been centered around and ordered utilizing

ANN and k-nearest neighbor algorithms accomplishing a general normal precision of 90 %. For vegetables the Support Vector Machine and k-nearest neighbor algorithms are used for classification and these two achieves an accuracy of 85%.

The grain crops have been fragmented utilizing k-means clusters and canny edge detector algorithms. Variety, shape, texture, variety surface and irregular change highlights have been removed. SVM and k-nearest neighbor classifiers usedgetting a general normal exactness of 82%.

The next method is by employing the Fourier filtering, Canny or Sobel edge detection and by introducing many morphological operations to detect the anomaly present in the plant images.

Proposed Method

The course of plant illness framework fundamentally includes four stages as displayed in Fig 1. The main stage includes acquiring a high quality image. The subsequent stage fragments the picture into different parts for which various procedures can be applied. Next stage contains highlight extraction strategies and the last stage is classifying the diseases based on the training and algorithm employed.

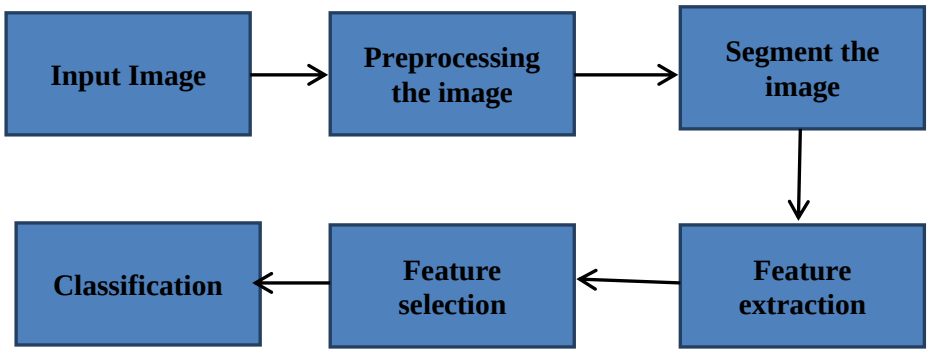

Fig 1: Stages of the proposed approach

Image Procurement

The image to be processed if first procured from a high quality device like a DSLR camera and then these images are archived in the database for training the algorithm and make it easier for the algorithm to detect the diseases quite easily.

Segmentation

This process is used to make it easier for the algorithm to analyze the image as the image are segmented into many useful and meaningful parts and the foreground and the background are discriminated using binarization methods. The sample image is shown in the figure 2, the binarized image is shown in the figure 3 and the edges are detected using the canny is shown in the figure 4. The binarization of the image is carried out using the OTSU algorithm as it employs global threshold value to separate the background from the foreground.

Extraction Of Features

Fig 2, Sample image

The region of interest ROI should be identified and then the features present in the area are extracted for further processing. Usually the features based on the textures, colors and shapes are extracted to facilitate the further classification processes. Feature extraction methods commonly used are histogram methods and gray scale co-occurrence matrix method.

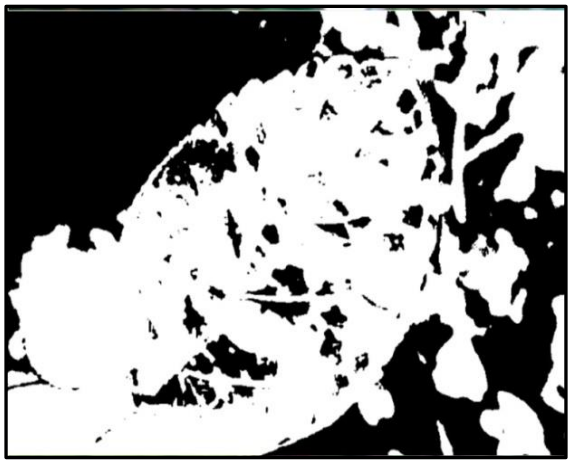

Fig 3: Binarized image

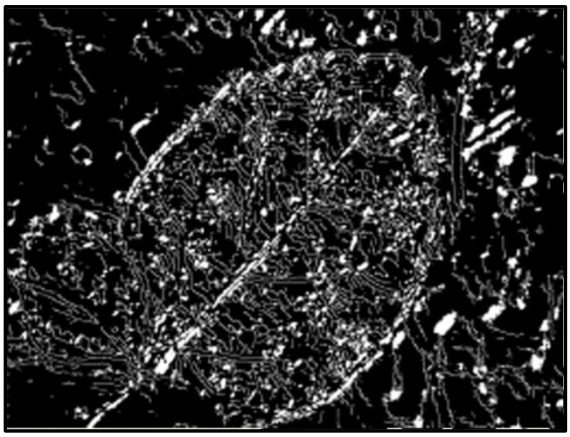

Fig 4: Edge detected image

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Classification

The final stage of the proposed approach is the classification and for this SVM, k-mean, neural networks and many well-known algorithms are employed. The ID3, C4 and naïve bayes algorithms are also used for this purpose.

Diseases In Plants

Plant illnesses are for the most part brought about by irresistible specialists like organisms, microbes, and infections. Indications of plant sickness are detectable proof of contamination and side effects are the noticeable impacts of these sorts of infection. Contagious diseases cause signs like noticeable spores, buildup, or shape and the essential side effects resemble leaf spot and yellowing. Parasitic sicknesses are plant diseases brought about by organisms. Parasites can be single or multi-cellular, yet regardless contaminate plants by taking supplements and separating tissue. Parasitic sicknesses are the most widely recognized disease in plants. The following figure shows the parasite infection and bacterial infections.

Fig 5: parasite infection in plants

Implementation

The proposed algorithm pseudo code is shown in the figure 6 and this algorithm detects the disease present in the leaves.

Algorithm Detect Leaf Anomaly (Image I)
INPUT: high resolution image OUTPUT: Classify the disease BEGIN: Load the image Pre-process the image Mask the green color in the image Calculate the threshold value IF green < threshold value Allot zero to blue, red and green pixels Remove the masked portions from image Use classification and detect the disease END

Fig 6: Pseudo code of the proposed algorithm

The input sample image to be tested is given in the following figure 7. This image is preprocessed that is it is resized to a fixed proposition like 300X280 to process the image quickly and in a better way. The filters are used to remove the distortions and noises present in the raw input images.

Fig 7: Sample input image to be processed

Fig 8: Red and green band separation

The Gray level Co-Occurrence matrix method is used to segment and then to detect the disease using the masked portions of the image. The GLCM is used to find the hidden relationship among the pixels present in the image and this clearly helps the classification algorithm to classify the classes. The classification is easily carried out by the support vector machine algorithm.

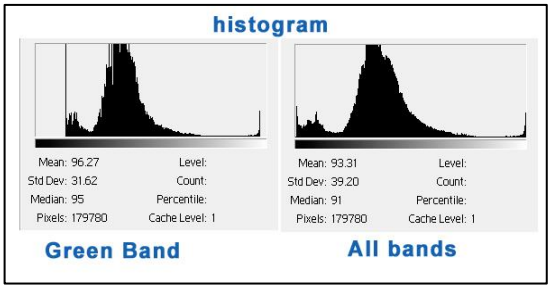

Fig 9: Histograms of each band

The histogram images are converted into grayscale images for masking and identification of the diseases as shown in the following figure.

The plant sicknesses influence each mass and nature of horticultural item. Ordinarily, varying sorts of illnesses are seen at totally different stages during the advancement of yields. Speed of unfurl change and furthermore the sort of compound. Additionally, this needs nonstop watching by advisors which could be restrictively expensive. Further, in cases, individuals need to go long courses just to contact appropriate experts, which is excessively expensive and furthermore time squander. This arrangement strategy is utilized to find the sort of plant sickness. In the given proposed approach, the SVM algorithm is utilized to detect the diseases impacted to the leaf structure effectively.

Fig 10: Masked images

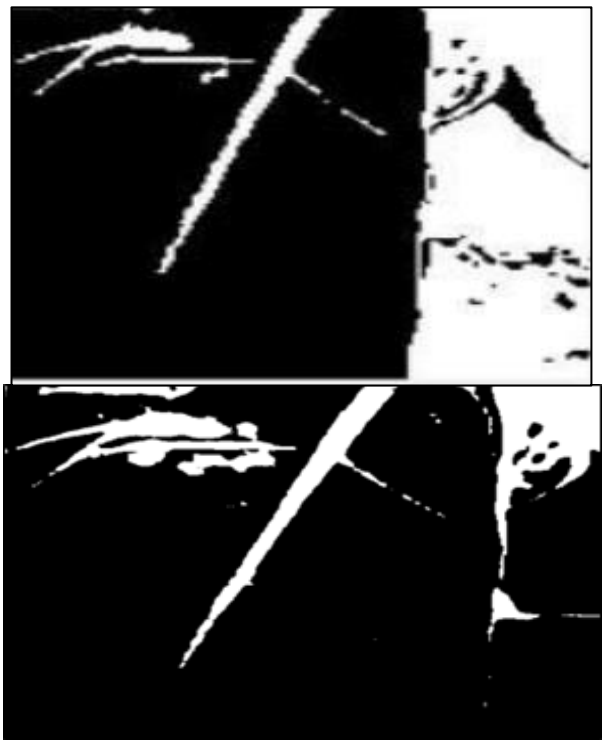

Fig 11: Masked with erosion and defects

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Fig 12: Defect Edge detected

The proposed algorithm was compared with neural network and the results clearly showcases that the proposed algorithm was more effective and accurate in detecting the diseases. The mango leaf is provided as an input and the two major disease are identified accurately. The accuracy is calculated after training the input data image and it is shown in the following figure.

Tab 1, Comparison table

Diseases	Neural network	Proposed
Rust	63.2%	91.5%
Rot	58.6%	89.7%

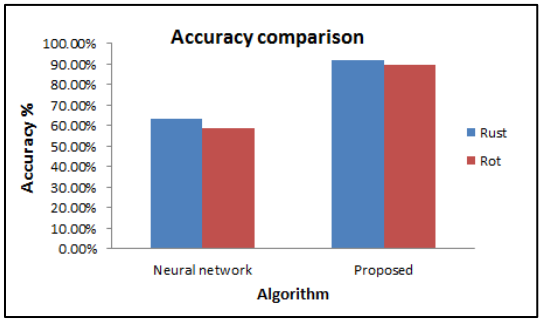

Fig 13: Comparison chart

Conclusion

By utilizing the above GLCM, SVM and few preprocessing techniques, the disease present in the plant are identified quite easily and this process doesn't involve any manual work and the software used to implement the aforesaid algorithms are MATLABS. The accuracy levels are compared with the neural network and from the experimental results it is quite clear that the proposed algorithm is accurate in detecting the diseases from the leaves of the crops.

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