



## A Review on Detection of Plant Diseases using Image Processing Technique

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### ABSTRACT

Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. The studies of the plant diseases mean the studies of visually observable patterns seen on the plant. Health monitoring and disease detection on plant is very critical for sustainable agriculture. It is very difficult to monitor the plant diseases manually requires tremendous amount of work, expertise in the plant diseases, and also require the excessive processing time. Hence, image processing is used for the detection of plant diseases. Disease detection involves the steps like image segmentation, feature extraction and classification. This paper discussed the method used for the detection of plant diseases using their leaves images.

Agriculture is a most important and ancient occupation in India. As economy of India is based on agricultural production, utmost care of food production is necessary. Pests like virus, fungus and bacteria causes infection to plants with loss in quality and quantity production. There is large amount of loss of farmer in production. Hence proper care of plants is necessary for same.

**Keywords:** *Image processing, Plant Diseases, Agriculture*

### I. Introduction

India is a cultivated country and from ancient times all the population depends on the agriculture. There exists diversity in selection of various plants and crops and there are many pesticides available for each and every plants. Diseases on plants cause various serious problems which reduces the quality and quantity of crops. The study of observable patterns on the plants and the

changes refers to plant diseases. Monitor the health and diseases on plant plays an important role in the successful cure for that diseases. In early days the detection and cure are done by the expertise person in that field. The monitoring of diseases requires tremendous amount of work and processing time. The image processing technique can also be used for plant disease detection. The symptoms seen on the leaves, stem, fruit. The plant leaf which shows the symptoms of diseases for that plant leaf detection is used. Agriculture is an ancient occupation. Monitoring plants and diseases from early stages is utmost important. It includes preparation of soil, seeding, adding manure and fertilizer, irrigation, disease detection, spraying pesticides, harvesting and storage. Pesticides are used to protect the plants from diseases hence they are called as protection product

Large amount of farmers uses pesticides on fruit plants, vegetables and cash crops for the protection of plants in India. Sometimes the overdose of pesticides can harm the crops as well as human beings and it may cause death of plants as well as human beings. Due the large amount of usage of pesticides it may leads to loss in nutrients and decreases the quality of plant. And if they are not washed properly it may cause harmful diseases to human beings. Most common technique used to spray is sprayer. In agriculture mechanical sprayer or hydraulic sprayer are used, and sometimes farmers spray it in less amount or in large amount. And farmers do not use protective clothing for spraying. Hence harmful pesticides enter into body by inhaling or through skin or eyes. It causes itching in eyes and skin hence to

avoid all these detection of disease and spray proper amount of pesticides is important. Hence by image processing proper shape, color of image can be identified.

Plant diseases have become the dilemma because it causes significant changes in quality and quantity of plants that is agriculture products. In 2007 plant disease losses in USA is approximately \$539 million. Millions of amount was spent on controlling the disease. This requires continuous monitoring by the experts which might be sometimes expensive. And in case of large farms it requires large amount of money. The experts can overcome the diseases properly. Automatic detection of disease on plants is an essential research topic. It may cause benefits in monitoring the large fields of plants. Hence we are looking for fast, automatic, less expensive and accurate method to detect plant disease The paper gives preview about the techniques used in the disease detection.

## II. Basic steps for plant disease detection

In this section the basic steps for the disease detection as shown in fig:

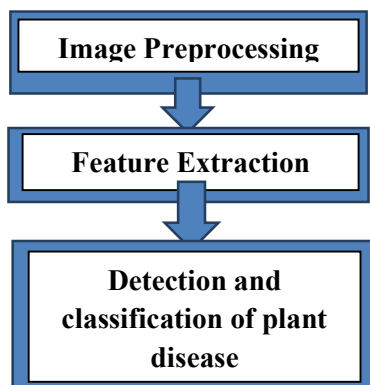


Fig 1

### A. Image Preprocessing

Image preprocessing is to remove noise from the image or other object removal, different preprocessing techniques. Here we are using Haar wavelet transformation algorithm. Haar wavelet transformation algorithm is used to transform RGB image into grey scale image. Haar wavelet was invented by Hungarian mathematician Alfred Haar. For an input represented by a list of  $2^n$  numbers, the Haar wavelet transform may be considered to pair up input values, storing the difference and passing the sum. This process is repeated recursively, pairing up the sums to prove the next scale, which leads to  $2^n - 1$  differences and a final sum

### B. Feature Extraction

Feature Extraction is an important part in the disease detection. It plays an important role in identification of an object. Feature extraction is used in many applications in image processing. Color, texture edges, morphology are the features which are used in disease detection.

Monica jhuria et al took color, morphology, texture as feature for the disease detection. It is found that morphological result gives more result than any other features. Texture shows how the color is distributed in the image, hardness of the image.

In Feature Extraction here we are using Haar algorithm, which first extract the feature of image and after the whole implementation of process it stores the new image on server and extract features from transformed server. Haar wavelets as the basis of transformation functions. Haar wavelet transformation is composed of a sequence of low pass and high pass filters, known as filter bank.

### Haar Algorithm

Read pixels of image

For  $i=0$  to image. Width

▫ For  $j=0$  to image. height

- Red  $[i, j] = (\text{double})\text{Scale}(0, 255, -1, 1, I[i, j].R);$
- Green  $[i, j] = (\text{double})\text{Scale}(0, 255, -1, 1, I[i, j].G);$
- Blue  $[i, j] = (\text{double})\text{Scale}(0, 255, -1, 1, I[i, j].B);$

▫ End For

▫ End For

▫ For  $j=0$  to image. Height

- Perform 1D transformation

▫ End for

▫ For  $j=0$  to image. Height

- For  $i=0$  to image. Width

- Perform 2D transformation

- End for

- End for
- Store new image on server
- Extract features from transformed server

### C. Detection and Classification of Plant Diseases

The final stage is the detection of the diseases and with the help of disease classify the plants with the disease matches with the given dataset. For the disease detection and classification, we are implementing the deep learning algorithm.

Deep learning algorithm is used to classify the specified image into appropriate disease hence it will be easy to detect the disease and find out the remedy over the disease.

### III. Deep learning algorithm

In the deep learning algorithm detection and classification can be done. Here one image is given the algorithm read the vector matrix of image that is features of image. After the vector matrix the extracted features matches with the trained dataset containing the disease wise features. In the dataset match the extracted disease with the given diseases i.e. fetch matching diseases. After that calculate how many links are matching with the extracted image. Here suppose  $Z$  be the weight of the diseases.  $Z$  gives the similarities between the image features and the trained data set.

The activation function used to filter out the disease using the activation function value. The activation function value is calculated as follows:

$$f(z) = 1 / (1 + \exp(-z))$$

Deep learning is layered algorithm, when output of first layer is calculated then the output is transferred to the next layer, again in the next level calculate the activation function value. Repeat the same procedure for each layer until the output reduces to one or two disease.

### IV. Advantages

1. Efficient and user friendly system
2. Improved accuracy with the help of Haar Algorithm and Deep learning algorithm
3. Increased layers of deep learning algorithm to get most accurate and appropriate result.

### CONCLUSION

For successful cure of the plant and crops it is necessary to detect plant diseases accurately. Hence from above discussion it is proved that image processing technique is useful in detection. By using this technique, we can properly classify and identify the diseases. Haar wavelet transform is used for proper classification of images and deep learning algorithm is used for accuracy. Hence it is proved that these techniques are applicable for the detection of diseases.

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