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A Survey on Plant Disease Identification Techniques

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Abstract: ***Plants are classified according to the shapes, colours & structures of their leaf, & flower. Edge Detection of Plant Leaf images & Detection of Disease is one of the important research topics in Image Processing. Many authors suggest that object shape is more useful than its appearance properties. But it cannot Give 100% Result. Because many Factor effect to this like Overlapping of Plant Leaf, Room Condition, Shadow of images etc. This paper represents the survey of various approaches being used in disease identification system.***

Keywords: Image processing, FRR, FAR, RR, PCA, ROI

I. INTRODUCTION

In agriculture field, Plants are important means of livelihood and production of human beings. The relations between plants and human beings are also very close. Plants maintain the balance of oxygen and carbon dioxide of earth's atmosphere.

Plant disease can be identified using different methods. The diseased image has environmental effects like weather, light and other conditions. The plant image is separated from its complex surrounding and then disease will be identified.

Viruses are sub microscopic entities capable of causing disease. They are a piece of nucleic acid (genetic material) surrounded by a protein coat. Once inside the plant cell, the nucleic acid portion directs the plant cell to produce more virus nucleic acid and virus protein, disrupting the normal activity of the cell. Viruses can multiply only inside a living cell. While some viruses, such as cucumber mosaic, die quickly if outside a cell or if the cell dies, other viruses such as tobacco mosaic retain their ability to infect for years after the infected plant part dies. Many different viruses can infect plants. Certain crops are well known to be affected by virus diseases including geraniums, roses, Easter lilies, dahlias, gladiolus, and tulips.

The image processing can be used in agricultural applications for following purposes:

» To detect diseased leaf, stem, fruit

» To quantify affected area by disease.

» To find shape of affected area.

» To determine color of affected area.

» To determine size & shape of fruits.

II. General Methodology

General methodology involves following steps:-

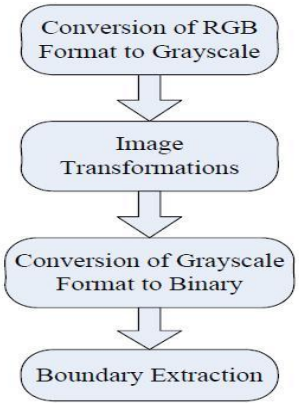

Figure 1 General Methodology [2]

RGB to grayscale conversion: for converting a color from a color space, we required weighted sums which must be calculated in a RGB space. And RGB color model to a grayscale representation of its luminance.

Image transformations: A function or operator that takes an image as its input and produces an image as its output. Depending on the transform chosen, the input and output images may appear entirely different and have different interpretations. Fourier transforms, principal component analysis, and various spatial filters, are examples of frequently used image transformation procedures.

Gray scale to binary conversion: gray scale image can be converted into the binary image using Thresholding. Thresholding technique can be histogram based, clustering based etc.

Boundary extraction: Through boundary extraction we can find the pixels that are on the objects at boundary in the image. For the boundary extraction any morphological algorithm is used.

III. Types of Diseases

Figure 2 Powdery mildew Disease

Figure 3 Downy mildew Disease

Figure 4 Anthracnose Disease

IV. Literature Review

A Proliferation of literature is available in plant leaf disease detection. We will highlight some of the key contributions.

A methodology for detecting plant diseases early and accurately using diverse image processing techniques has been proposed in which they have used fuzzy logic technique to identify plant disease. They have used rgb color model to extract rgb information from images. They have identified two diseases namely downy mildew and anthracnose. It is found that the anthracnose disease with 67% of accuracy and downy mildew achieved 70% of accuracy. Instead of rgb model we can use ycbcr or hsv model. We can apply same technique for more number of watermelon samples [1]. In this paper they have used computer vision image enhancement. Computer vision image enhancement includes color conversion and histogram equalization. Color conversion is used for converting rgb images to grayscale images. Histogram equalization is used for image clarity [2]. In this paper K-means clustering technique is used to partition the leaf image into clusters in which one or more clusters contain the disease in case when the leaf is infected by more than one disease. Masking is done for comparing threshold value with the boundary values. Features of the leaf are extracted using color co-occurrence method [3]. In this paper, they have used Artificial Neural Network. They have taken two databases one for training of already stored disease images and the other for implementation of query images. They have considered three feature vectors namely color, texture, and morphology. From these three features morphology gives more correct result compared to other two feature vectors. The query image is segmented into six grades depending on percentage of infection [4]. Thresholding is deployed to mask green pixels and image is processed to remove noise. Then grape leaf disease segmentation is done Using K-means clustering [5]. It uses a novel approach to detect the infected areas of the plant by segmenting the plant leaves by clustering. K-means clustering is performed for different cluster centre's to obtain different cluster groups of the region of interest (ROI)[6]. In this paper Wavelets and PCA techniques are compared. Principal component analysis (PCA) is used for computing Eigen vectors and reducing dimensionality. Then Eigen vectors are calculated for each image for the training set. Wavelets can be used to extract information from audio signals and images. Sets of wavelets are generally needed to analyze data and for hierarchically decomposing functions [7].

V. Error Rate

In disease identification system performance is evaluated in term of error rate []. Different types of error rates are False Rejection Rate (FRR), False Acceptance Rate (FAR), and Recognition Rate (RR).

A. FAR (False Acceptance Ratio)

The false acceptance ratio is given by the number of non diseased images accepted by the system with respect to the total number of comparisons made.

B. FRR (False Rejection Ratio)

The false rejection ratio is the total number of diseased images rejected by the system with respect to the total number of Comparison made.

C. RR (Recognition Rate)

Recognition Rate is the number of diseased images is identified from total number of images stored.

VI. Conclusion

This paper presents a brief survey of the recent works done on disease identification. Different existing methods and approaches are discussed. Lots of work has been already done, still there are many challenges in this research field. First it is difficult to develop one general system to classify every type of disease. Publicly available disease datasets of real plant images would make it possible for researchers to achieve a better performance in this field. Most of the researchers have proposed or

developed their systems for a limited type of disease. So, Future work should be extended by fusion of different techniques for better identification.

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