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CBIR in Image Based Medicinal Plant Diseases

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Abstract

Diseases in plants cause major production and economic losses in agricultural industry worldwide. Monitoring of health and detection of diseases in plants and trees is critical for sustainable agriculture. Medicinal plants form the backbone of a system of medicine called ayurveda and is useful in the treatment of certain chronic diseases. Ayurveda is considered a form of alternative to allopathic medicine in the world. This system of medicine has a rich history. Ancient epigraphic literature speaks of its strength. Ayurveda certainly brings substantial revenue to India by foreign exchange through export of ayurvedic medicines, because of many countries inclining towards this system of medicine. The most significant part of research on plant disease to identify the disease based on CBIR (content based image retrieval) that is mainly concerned with the accurate detection of diseased plant.

Keywords:- **Image processing, CBIR, Canny edge detection algorithm,ayurvedic medicinal system.**

1. INTRODUCTION

It is important for ayurvedapractioners and also traditional botanists to know how to identify the medicinal plants through computers.Based on the color space, histogram, and edge detection techniques, we can able to find the disease of plant. Hence here is a proposal of identification of these plants using leaf edge histogram, color histogram and leaf area. It is necessaryto make people realize the importance of medicinal plants before their extinction. There is Considerable depletion in the population of certain species ofmedicinal plants. Hence we need to grow more of these plant species in India. Farmers are suffering from the problemrising from various types of plant traits/diseases. Sometimes plant's doctors are also unable to recognize the disease that results in lack of identification of right type of disease and this leads to crop spoil if not taken care of at right time.

1.1 Types of Diseases

Plant diseases may be broadly classified into three types. They are bacterial, fungal and viral diseases.

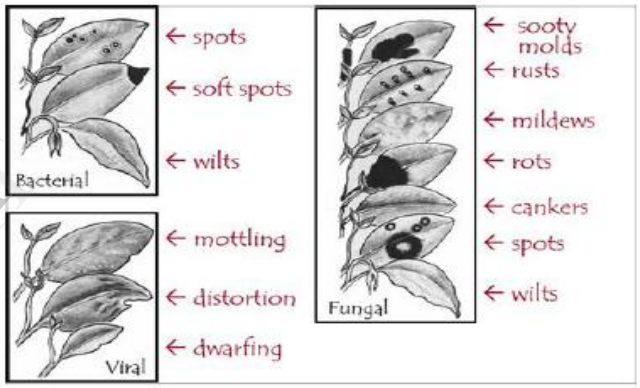

Fig 1: Types of Diseases

1.2 Problem of agricultural plant diseases

India is an agricultural country; wherein about 70% of the population depends on agriculture. Farmers have wide range of diversity to select suitable Fruit and Vegetable crops. It can be improved by the aid of technological support. The management of perennial fruit crops requires close monitoring especially for the management of diseases that can affect production significantly and subsequently the post-harvest life. Plant diseases cause periodic outbreak of diseases which leads to large scale death and famine. The forests in India are the principal repositories of large number of medicinal plants, which are largely collected as raw materials in preparation of ayurveda medicine. Ayurveda practitioners use the parts of these medicinal plants such as

leaves, stems and seeds in the preparation of medicines.It is necessary to develop an automatic method that identifies the medicinal plants from their images. Different features need to be extracted using image processing techniques for identification. In order to identify plants and to differentiate between them certain features are used, which act as the distinguishing features. Since the effects of plant diseases were devastating, some of the crop cultivation has been abandoned.

1.3 Content Based Image retrieval (CBIR)

Content based image retrieval (CBIR) offers efficient search and retrieval of images based on their content. With the abundance and increasing number of images in digital libraries and the Internet in the last decades, CBIR has become an active research area. The retrieval may involve the relatively simpler problem of finding images with low level characteristics (e.g. finding images of sunset) or high level concepts (e.g. finding pictures containing bicycles).With the development of the Internet, and the availability of image capturing devices such as digital cameras, image scanners, the size of digital image collection is increasing rapidly. This paper is organized as follows; Section 2 introduces features; Section 3 gives the literature review; Section 4 discusses our proposed methods; Section 5 gives the conclusion to the problem.

2.Features

Area of Leaf

In this process, the area of coin is taken as the reference. Adjust the distance between the camera and the coin (nominal distance) and capture an image. Specifically one rupee coin is chosen as reference whose area is:

Area of coin= π (d/2) 2; where'd' is diameter of the coin.

= π (2.5 cm/2) 2

= 4.9063 cm^2

Convert this color image of coin to its grayscale and hence to its binary equivalent image. Calculate number of pixels occupying the vicinity of the coin. Suppose the pixel count of the coin from the image is 148 then:

1 pixel value= area of coin/pixel count

= 4.9063/148

= 0.03315 cm^2

Consider the leaf case. Maintain the same nominal distance as for the case of coin. Convert the color image to its grayscale equivalent. Hence convert to binary and calculate the number of pixels occupying the area of the leaf. Suppose for leaf, the pixel count of the area is 3724 pixels, then:

Area of leaf= pixel count* 1 pixel value

= 3724*0.03315

= 123.4506 cm^2

Algorithm:

Step 1: start

Step 2: acquire the leaf image

Step 3: convert color image to grayscale

Step 4: convert grayscale to binary

Step 5: count number of pixels in the leaf vicinity

Step 6: multiply pixel count with one pixel value

Step 7: compare with database image

Step 8: stop

Fig 2: Healthy and diseased image of plant

Edge Histogram

Every leaf is having its own edge features. Some leaf boundaries are saw tooth, some are smooth and some are wavy so on. Also midrib alignment and vein pattern of leaves are different.

Algorithm:

Step 1: start

Step 2: acquire the leaf image

Step 3: convert color image to grayscale

Step 4: Apply Canny edge detection algorithm

Step 5: Calculate histogram

Step 6: Compare with edge histogram of the database image

Step 7: Stop

3. LITERATURE REVIEW

H. Al-Hiary, S Bani-Ahmad, M Reyalat, M Braik and Z ALRahamneh presents the plant diseases are detected for few sample only and using the k-map techniques the applications of K-means clustering and Neural Networks (NNs) have been formulated for clustering and classification of diseases that affect on plant leaves. Recognizing the disease is mainly the purpose of the proposed approach. Thus, the proposed Algorithm was testedon five diseases which influence on the plants; they are: Early scorch, Cottony mold, ashen mold, late scorch, tiny whiteness. The experimental results indicate that the proposed approach is a valuable approach, which can significantly support an accurate detection of leaf diseases in a little computational effort. Three are two main characteristics of plant-disease detection machine-learning methods that must be achieved, they are: speed and accuracy. The color co-occurrence texture analysis method was developed through the use of Spatial Gray-level Dependence Matrices (SGDM‟s). The gray level co-occurrence methodology is a statistical way to describe shape by statistically sampling the way certain grey-levels occur in relation to other grey-levels. In this paper, neural networks are used in the automatic detection of leaves diseases. Neural network is chosen as a classification tool due to its well known technique as a successful classifier for many real applications. The training and validation processes are among the important steps in developing an accurate process model using NNs. The dataset for training and validation processes consists of two parts; the training feature set which are used to train the NN model; whilst a testing features sets are used to verify the accuracy of the trained NN model.Not involving the advantages of hybrid technique Dedicate the future works on automatically estimating the severity of the detected disease[1].

N. Valliammal presents this paper focused on the preprocessing step of CAP-LR. Pre-processing is the basic step to reconstruct the image with some useful feature. This technique is essential for the enhancement of leaf images which increases the efficiency of the subsequent tasks of the leaf recognition system Leaf images normally changes to blurred images by the presence of noise and low or high contrast both in the edge area and image area. In this paper, an approach that simultaneously adjusts contrast and enhances boundaries is presented. Image enhancement is basically improving the interpretability or perception of information in images for human viewers and providing `better' input for other automated image processing techniques. During this process, one or more attributes of the image are modified. The contrast of an image is the distribution of its dark and light pixels. A low-contrast image exhibits small differences between its light and dark pixel values. The histogram of a low-contrast image is narrow As multiple noise damages the quality of nature images, improved enhancement technique is required for improving the contrast stretch in leaf images [2].

S. Ananthi S. Vishnu Varthini presents an application of texture analysis in detecting the plant diseases has been explained. Recognizing the disease is mainly the purpose of the proposed approach. About 500 plant leaves of 30 different native plant species of Tamil Nadu have been collected for analysis. The acquired leaf images are converted into HSI format. From the hue content, the co-occurrence features like contrast, energy, local homogeneity, shade and prominence are derived. The feature sets are used for analysis of disease type of particular species. In this paper, detection and classification of leaf diseases has been proposed, this method is based on masking and removing of green pixels, applying a specific threshold to extract the infected region and computing the texture statistics to evaluate the diseases. Plant diseases may be broadly classified into three types. They are bacterial, fungal and viral diseases. The experimental results indicate the proposed approach can recognize the leaf diseases with little computational effort. Automatically detect the diseases from the symptoms that appear on the plant leaves is the research topic is mentioned in this paper. Extension of this project is to increase the recognition rate of classification process [3].

Arunkumarbeyyala and saipriyabeyyala presents Crop diseases are caused by pathogens fungi, virus and bacteria but there is a problem of complexity of visual pattern. Disease is caused by pathogen which is any agent to cause disease. In most of the cases traits or diseases are seen on the leaves or stems of the plant. Therefore identification of plants, leaves, stems and then finding out the diseases, percentage of the disease incidence. Hence there was an enormous demand for specific and sophisticated image patterns understanding. this paper presents the techniques for detection of plant traits or diseases using Image Processing. These techniques are used to decrease the difficulty in detecting the plant diseases. they develop an effective image processing module for early diagnosis of disease, even before symptoms expression, for deadly diseases viz., Bud rot and Basal stem rot disease in Coconut (C*ocas nuciifera*L), Mosaic and Greening [4].

K. Padmavathi present a study was completed to investigate the use of computer vision and image processing

techniques in agricultural applications. This system identifies leaves disease of plants and also determines the stage in which the disease is. The system has various image processing techniques. At first, the images are captured and processed for enhancement. Then image segmentation is carried out to get disease regions. Later, image features such as shape, colour and texture are extracted for the disease regions. There are various techniques for imagesegmentation such as clustering methods, compression basedmethods, histogram-based methods, region growing methods etc. Generally, first the digital images are acquired from the environment using a digital camera. Then image processing techniques are applied to the acquired images to extract useful features and analysis. Pre-processing creates an enhanced image that is more useful or pleasing to a human observer. Pre processing uses various techniques like image resize, filtering, segmentation, morphological operations etc. In biological science, sometimes thousands of images are generated in a single experiment. These images can be required for further analysis of plant diseases. [5].

PranjaliVinayakKeskar, ShubhangiNimbaMasare, Manjusha Suresh Kadam gives the actual database of the project is stored in the PC. In this paper leaf disease detection and diagnosis system is developed to automate the inspection of affected leaves and helps identifying the disease type and thus provide corrective action. HSI (Hue Saturation Intensity) system is commonly usedcolour space in an image space, which is more intuitive tohuman vision. HSI system separates colour information ofan image from its intensity information. The disease affected leaf to be tested is compared with database in the PC which gives result and displays. The developed system consists of four stages which includes HSI transformation, histogram analysis and intensity adjustment. Feature extraction is the third stage which deals with three features namely; colour, size and shape of the spots. In previous papers they are not using the CBIR system and simple method for detection of leaf diseases. A set of features was selected to be extracted using feature extraction phase, and those featureswere stored in the feature database, which is designed forthis purpose. The captured leaf image parameters werecompared with the parameters of healthy leaf and diseasewas detected. According to disease pesticide control wasdone [6].

4. PROPOSED METHODOLOGY

The methodology here gives the identification of medicinal plants based on its edge features. The color image is converted to its grayscale equivalent image. From this grayscale image, calculate the edge histogram. Apply Canny edge detection algorithm for this purpose. The next information i.e., the area is calculated by the proposed algorithm. The next information is the color of the image which is extracted in the form of the histogram for the overall image. Plant diseases cause major production and economic losses in agriculture and forestry. The bacterial, fungal, and viral infections, along with infestations by insects result in plant diseases and damage. The medicinal plants are used in ayurvedic medicines. Manual identification of medicinal plants requires a priori knowledge. The color histograms are obtained in RGB color spaces. This system of medicine is useful in the treatment of certain chronic diseases such as cancer, diabetes, blood pressure, skin problems etc. But, the knowledge of these plants dies with the experts, because of the fact that the experts do not share with others. Hence it is necessary to use technology and develop tools for the recognition and use of medicinal plants from their image.

Image Acquisition:

The images of leaves of medicinal plants were obtained from a 5 mega pixel camera and it was resized later asper our requirement. The distance between camera and the leaf was maintained to be 15cms and the image wastaken from the top view. All the images were taken in natural day light with white background.

Devised methodology:

The methodology here gives the identification of medicinal plants based on its edge features. The color image is converted to its grayscale equivalent image. From this grayscale image, calculate the edge histogram. Apply Canny edge detection algorithm for this purpose.

The step-by-step procedure:

i)1st Phase

Phase- I of disease image detection, the RGB images of healthy and infected plants will picked up.

ii)2nd Phase

Second step of detection of plant diseases start with the training process .Then separate the layers of RGB image into Red, Green and Blue layers and then apply the CANNY's edge detection technique to detect the edges of layered images.

iii) 3rd Phase

In the Third phase, choose the test sample of plant. When the testing sample is selected, the training process will started again on the testing image.

iv) 4th Phase:

In the training process, first I separate the layers of tested image into Red, Green and Blue layers and again apply CANNY's edge detection technique to detect the edges of layer's images.

v)5th Phase

The comparison is firstly with the testing sample and the healthy sample if the testing sample is diseased, it compare testing sample with the diseased sample and type of disease is also detected.. These steps take few minutes to display the comparison result that is the testing sample is diseased or not.

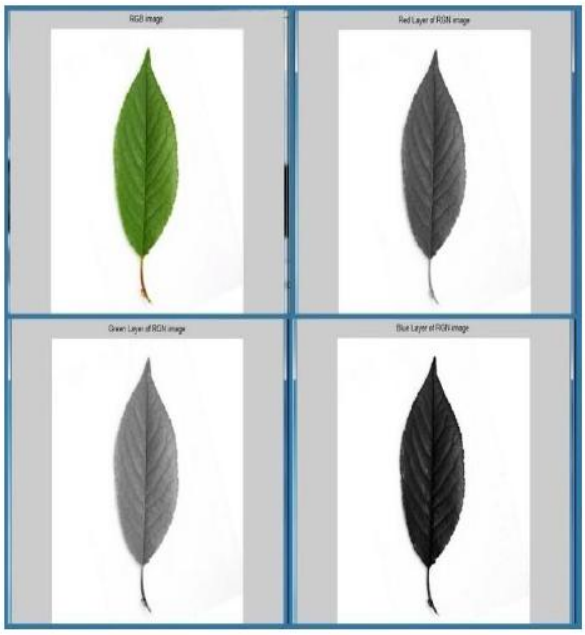

Fig 3 - Red, green, and blue layers of RGB images

5. CONCLUSION

To wind up all the information discuss above, I should like to conclude that it is a efficient and accurate technique for automatically detection of plant diseased. In this research, plant diseased is detected by using histogram matching. The histogram matching is based on the color feature and the edge detection technique. The color features extraction are applied on samples that are contained the healthy leaf of plant and the diseased leaf of the plant. The training process includes the training of these samples by using layers separation technique which separate the layers of RGB image into red, green, and blue layers and edge detection technique which detecting edges of the layered images. Once the histograms are generated for both samples and the testing image, immediately we applied the comparison technique based on the histogram. The comparison is firstly with the testing sample and the healthy sample if the testing sample is diseased, it compare testing sample with the diseased sample and these steps take few minute to display the comparison result that is the testing sample is diseased or not and which type of disease. When the comparison is applied the waiting bar is display on our display and results will be shown.

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