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Research Article

DEVELOPMENT OF SOFT COMPUTING TECHNIQUE FOR IDENTIFICATION OF LEAF DISEASES IN PEPPER PLANTS

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A R T I C L E I N F O

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A B S T R A C T

Images convey relevant data and information in biological sciences. Digital image processing and the image analysis technology have a vital role in biology and agricultural sectors. Automatic detection of plant diseases and cultivation of healthy plants is of great importance. In the case of a plant, the term disease is defined as any impairment happening to the normal physiological function, producing characteristic symptoms. The studies of plant diseases refer to studying the visually observable patterns of a particular plant. The identification of plants, leaves, stems and finding out the pests or diseases, or its percentage is found very effective in the successful cultivation of crops. The naked eye observation is the approach adopted by many of the farmers for the detection and identification of plant diseases. It requires continuous monitoring and found less useful on large farms. Also, the farmers are unaware of non-native diseases. With the aid of imaging technology the plant disease detection systems automatically detect the symptoms that appear on the leaves and stem of a plant and helps in cultivating healthy plants in a farm. These systems monitor the plant such as leaves and stem and any variation observed from its characteristic features, variation will be automatically identified and also will be informed to the user. This paper provides an evaluative study on the existing disease detection systems in plant.

INTRODUCTION

India is a cultivated country and about 70% of the population depends on agriculture. Farmers have large range of diversity for selecting various suitable crops and finding the suitable pesticides for plant. Disease on plant leads to the significant reduction in both the quality and quantity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants. Monitoring of health and disease on plant plays an important role in successful cultivation of crops in the farm. In early days, the monitoring and analysis of plant diseases were done manually by the expertise person in that field. This requires tremendous amount of work and also requires excessive processing time. The image processing techniques can be used in the plant disease detection. In most of the cases the disease symptoms are seen on the leaves, stem and fruit. The plant leaf for the detection of disease is considered which shows the disease symptoms [1,2].

The image processing could be used in the field of agriculture for several applications. It includes detection of diseased leaf, stem or fruit, to measure the affected area by disease, to determine the color of the affected area.

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Pepper cultivation is one of the most remunerative farming enterprises in India. Black pepper is the most commonly used spice in the world. Its successful growth was reported in areas where the temperature ranges from 15-400ºC. The pepper plants give the better cultivation if sufficient requirement is provided [2,3]. Plant disease is one of the main causes which degrade the quantity and quality of the product. The naked eye observation by the experts is approach usually taken in identification and detection of plants [4,5]. This approach is time consuming in huge farms or land areas. This paper discusses the importance of image processing techniques in detection and identification of plant diseases in the earlier stages and thereby the quality of the product could be increased.

Motivation

Since pepper is one the main export commodity, which fetches Lakhs of crores income for country. It is necessary to have the more yields with good quality which is essential in the international market. For better improvement of the pepper yield certain procedures has to followed including breed, fertilizers and prevention of various diseases by examining at proper time can also be considered.

In order to raise the standard of the farmer and their yield advance technologies should be adapted for detection of various diseases and their treatments.

The most common diseases of pepper plants are bacterial, fungal and virus. In the present project we are detecting the bacterial blights caused by bacteria. The leaf spots that appear on the lower surface of older leaves as small pimples, and on the upper leaf surface as small water soaked spots are symptoms of bacterial blight. Bacterial leaf spot is spreading by splashing, rain and working with wet infected plants. Infected leaf has small, circular pale green raised spots. Eventually the spots become chocolate brown with a paler-brown centre on the lower leaf surface. During severe infestation, the plants drop most of its leaves, leaving its fruits exposed to direct sunlight; infected fruits have circular green spots, as the bacterial growth progress the spot turn to dark brown to black with raised, cracked, scabby surfaces.

Proposed Work

At first, the given leaf image is given as the input of pre-processing unit in MATLAB, then the further processes such as feature extraction and classification are performed using ANN. After classifying the image, the classified output is record.

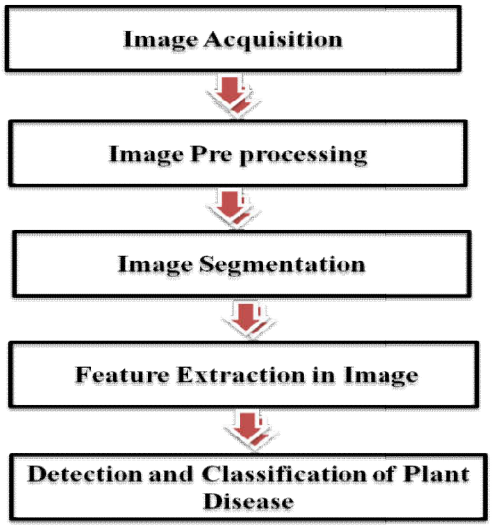

Figure 1 Proposed flow chart for detecting leaf diseases.

Image acquisition

We will obtain the input images from the data set.

Color Transformation

The RGB images were converted into HSV color space representation. In the RGB model each color appears in its primary spectral components of red, green and blue and this model is based on a Cartesian co-ordinate system. Though RGB model matches to the human eye in such a way as strongly perceptive to the primary colors, this model is not well suited for describing colors in terms that are practical for human interpretation. To avoid these limitations, the acquired RGB images were converted into HSV format. After the conversion from RGB to HSV, the hue and saturation components are taken for further analysis since these two components contain most of the information. Computations from RGB to HSV are carried out on a per pixel basis.

Image Segmentation

The segmentation process is carried out in two phases, (i) The masking process and (ii) Threshold based segmentation (iii) K-means clustering

K-means clustering color based

K means clustering is a method through which a set of data points can be partitioned in to a several disjoint subsets where the points in each subset are deemed to be 'close' to each other (according to some metric). A common metric at least when the points can be geometrically represented, is your bog standard euclidean distance function. The 'K' just refers to the number of subsets desired in the final output. In turns out this approach is exactly what we need to divide our image in to a set of colors.

Feature Extraction

Feature extraction is the process of defining a set of features, or image characteristics, which will most efficiently or meaningfully represent the information that was important for analysis and classification. Feature extraction involves reducing the amount of resources required to describe a large set of data. The extracted features are expected to contain the relevant information from the input data, so that the desired task can be performed by using this reduced representation instead of the complete initial data. An important approach to region descriptions is to qualify its texture content. Texture descriptor provides measures of properties such as smoothness, coarseness and regularity. In this work statistical techniques are used to describe the textures. In this step grey level co-occurrence matrix of the leaf images are calculated. Grey-level co-occurrence matrix (GLCM) creates a matrix from image, a given image I. This matrix creates the GLCM by calculating how often a pixel with grey-level value I occurs horizontally adjacent to a pixel with the value j. Each element (I, j) in GLCM specifies the number of times that the pixel with value I occurred horizontally adjacent to a pixel with value j. If I be an intensity image, GLCM scales the image to eight grey-levels. Texture features can be extracted using the GLCM values.

Disease Classification

The classification process is done by adopting Neural Network. Back propagation method is considered under the supervised learning mechanism. The feed forward back Propagation Neural Network is generally consisting of three layers such as an input layer, a hidden layer, and an output layer.

In this project we are going detect and calculate the infections of the leaf using the image processing techniques by extracting the local features using MATLAB and comparing the segmented image with healthy leaf to detect the infection of the leaf.

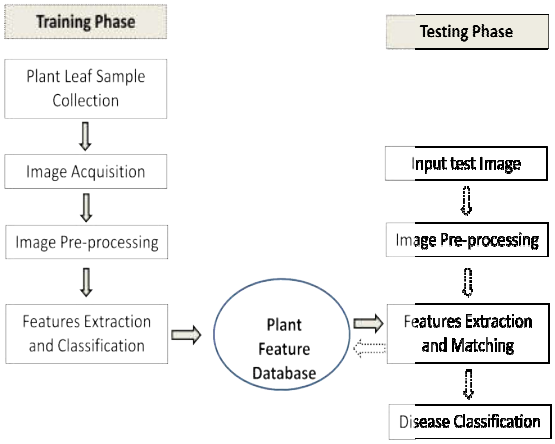

Figure 2 Flow chart showing basic steps for plant disease detection and classification.

Modules of Project

- Image acquisition and pre-processing – Pre-processing is done by contrast stretch.
- Segmentation is carried out by advanced K means for color images.
- Feature Extraction is done by color co-occurrence method for generation of statically features (GLCM).
- Classification is done by ANN.

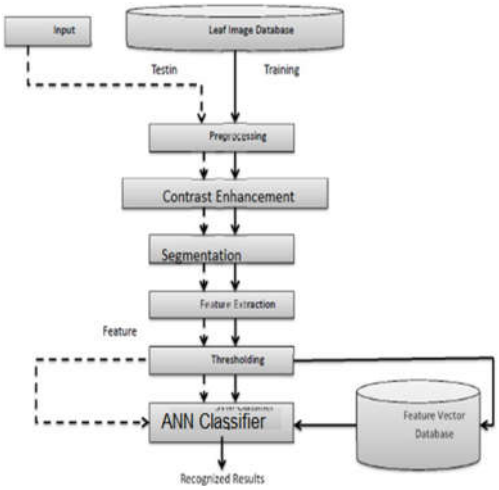

Fig 4 Block diagram showing the complete architecture of the project

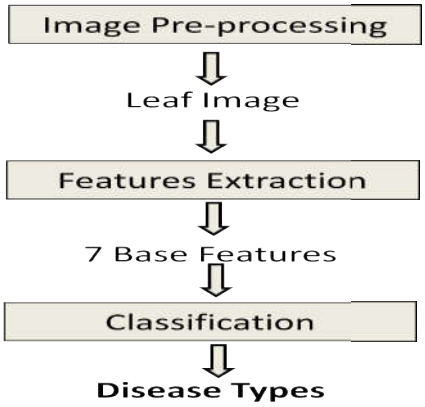

Fig 3 Modules of Project

CONCLUSION

An image processing algorithm is considered for detection and identification of disease in pepper plant leaves. The set of pepper plant leaves are taken to find out the disease. The algorithm gives better results and healthy and unhealthy plants can be differentiated with the help of this algorithm. This algorithm helps in identifying the presence of diseases by observing the visual symptoms seen on the leaves of the plant. The MATLAB software is used to develop the proposed algorithm, the software helps farmers to identify disease in early stage or later stage, with help of this, farmers can identify disease and by applying proper medicines, they can improve their quantity of yields as well as quality. This also helps farmers to avoid the diseases for further spreading.

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