Content Based Image Retrieval in Plant disease Detection

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Abstract—*Farmers are distressing from the problem increasing from various types of plant traits/diseases. Maximum plant diseases are caused by fungus, bacteria, and viruses. Fungi are acknowledged mostly from their morphology, with importance placed on their multiplicative structures. Bacteria are considered more embryonic than fungi and life cycles are not complex. With few exceptions, bacteria exist as single cells and increase in numbers by isolating into two cells during a process called binary fission. Viruses are extremely tiny particles consisting of protein and genetic material with no associated protein. The term disease is usually used only for destruction of live plants.Farmers experience great difficulties in changing from one disease control strategy to another. Relying on pure naked-eye observation to detect and classify diseases can be expensive various plant diseases pretense a great threat to the agricultural sector by decreasing the life of the plant. 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 correct detection of diseased plant. It has significant perception in field of agriculture. This paper describes effective; sample techniques for identify plant disease. In this paper a simple method is proposed to evaluate the severity of disease on plant, name of the disease and the remedy*

Keywords:-fungi, morphology, cells, genetic material

I. INTRODUCTION

Agriculture is the mother of all cultures. It has played a vital role in the development of human civilization. India is an agricultural country; wherein about 70% of the population depends on agriculture. Agricultural practices such as irrigation, crop rotation, fertilizers, and pesticides were developed long ago, but have made great progresses in the past century. By the early 19th century, agricultural techniques had so developed that yield large production of crops as compared with middle years. Agricultural production system is a consequence of a composite interaction of soil, seed and agro chemicals (including fertilizers). Therefore, prudent management of all the inputs is essential for the sustainability of a complex system. The concentration on improving the productivity, without considering the ecological impacts has resulted into ecological degradation. Without any adverse consequences, enhancement of the productivity can be done in a sustainable manner. The plant exists as well as grows around without us. Many of them are so useful for human development. As diseases of the plants are unavoidable, detecting disease plays a major role in the field of Agriculture. Plant disease is one of the dynamic causes that degrade quantity and quality of the agricultural products.

Fig. 1: Images of Plants affected by disease

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

1. To detect diseased leaf, stem, fruit.
2. To quantify affected area by disease.
3. To find the boundaries of the affected area.
4. To determine the color of the affected area.
5. To determine size & shape of leaf.
6. To identify the Object correctly.

Etc.

II. LITERATURE SURVEY

To know the state-of-the-art in automation of the task/activities in agriculture field and automatic detection of plant disease using computer vision techniques, a survey is made. The gist of a survey which carried out is given as follows.

(Mr. Pramod S. landge,et. al.2013)They propose and experimentally evaluate a software solution for automatic detection and classification of plant diseases through Image Processing**.**

(Prof. Sanjay B. Dhaygude, Mr.NitinP.Kumbhar, 2013) In this paper application of texture statistics for detecting the plant leaf disease has been explained Firstly by color transformation structure RGB is converted into HSV space because HSV is a good color descriptor .(2)

(ArunkumarBeyyala and Sai Priya Beyyala,2012) proposed to 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 in Citrus.

(Anand.H.Kulkarni, Ashwin Patil R. K.,2012) proposes a methodology for detecting plant diseases early and accurately, using diverse image processing techniques and artificial neural network (ANN).(4)

(Dheeb Al Bashsish, *et al.*, 2011) have proposed to evaluate a software solution for automatic detection and

classification of plant leaf diseases. Neural networks are very effective in recognizing leaf diseases; k-means clustering technique provides efficient results in segmentation RGB images. (5)

(Jayamala K. Patil1 and Raj Kumar, 2011) gives advances in various technics used to study plant diseases/traits using image processing. The methods studied are for increasing throughput & reducing subjective ness arising from human experts in detecting the plant diseases.(1)

(Z. May and M. H. Amaran, 2011) have developed a new model of automated grading system for oil palm fruit is developed using the RGB color model and artificial fuzzy logic. The computer program is developed for the image processing part like the segmentation of colors, the calculation of the mean color intensity based on RGB color model and the decision making process using fuzzy logic to train the data and make the classification for the oil palm fruit.(6)

(Lili N.A., *et al.*, 2011) have used a modified Hierarchical Dynamic Artificial Neural Network which provides an adjustable sensitivity-specificity herbs diseases detection and classification from the analysis of noise-free colored herbs images. In this study, image processing and pattern classification are going to be used to implement a machine vision system that could identify and classify the visual symptoms of herb plants diseases. (7)

(D. S. Guru, *et al.*, 2011) have presented a novel algorithm for extracting lesion area and application of neural network to classify seedling diseases. First order statistical texture features are extracted from lesion area to detect and diagnose the disease type. These texture features are then used for classification purpose. A Probabilistic Neural Network (PNN) is employed to classify anthracnose and frog-eye spots present on tobacco seedling leaves.()

(D. Moshou, *et al.*, 2011) have developed a ground-based real-time remote sensing system that can be carried by tractors or robotic platforms is described. This prototype system makes possible the detection of plant diseases in arable crops automatically at an early stage of disease development and during field operations. The methodology uses differences in reflectance between healthy and diseased plants. Hyper spectral reflectance and multi-spectral imaging techniques were developed for simultaneous acquisition in the same canopy (8).

(H. Al-Hiary, *et al.*, 2011) have evaluated a software solution for automatic detection and classification of plant leaf diseases. The proposed solution provides faster and more accurate solution removed. The experimental results demonstrate that the proposed technique is a robust technique for the detection of plant leaves diseases (9).

(Anami B.S., *et al.*, 2009) have presented the use of computer vision technique on recognition and classification of bulk food grain image samples in the Indian context. (10)
C.C. Tuker S Chakraborty (2008) has presented software which detects and characterizes disease lesions on leaves to provide data on the number and type of lesions and the percentage of leaf area diseased using digital image processing (severity). (11)

A. Overview of Content Based Image retrieval (CBIR)

With the development of the Internet, and the availability of image capturing devices such as high resolution cameras, image scanners, the size of digital image collection is increasing rapidly. So it is necessary to professionally store and retrieve images for different use in many fields such as fashion design, security, investigation, medication, structural design, etc. For this purpose, many general use image retrieval systems have been developed. CBIR is a technique to retrieve images from a large database by using the components such as color, texture, shape etc. With the increase of abundant image data, today CBIR is very effective technique.

III. DISEASES ON VARIOUS PLANTS

A. Diseases on tomato plant

1) Septoria leaf spot

This disease of tomato plant is instigated by the fungus *Septorialycopersici.* Due to this disease considerable degradation in tomato production is seen Iowa.

Fig. 2:Septoria leaf spot symptoms

2) Anthracnose

Anthracnose, caused by the fungus *Colletotrichumcoccodes,* is probably the most common fruit-attackingdisease of tomato in Iowa. (6)

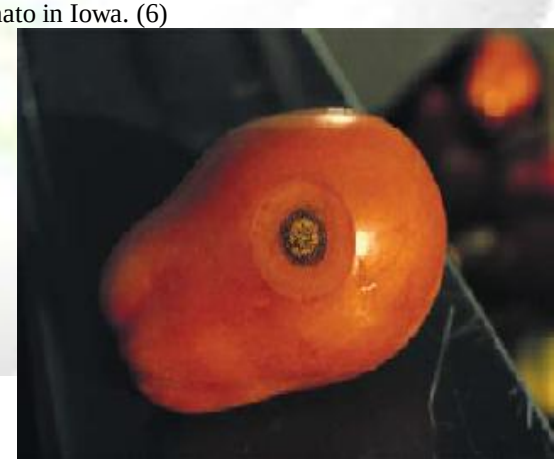

Fig. 3: Anthracnose fruit rot

B. Diseases on Soybean plant

1) Bacterial Blight

Bacterial Blight is caused by the Bacterium pseudomonas syringaePV. Glycinea. It was first reported in Nebraska in

1906 and is now the most common soybean bacterial disease.

Fig. 4: Bacterial Blight on leaves

2) Bacterial pustule

This disease is caused by Xanthomonasaxonopodis PV glycines. This can cause the defoliation, reduced seed size and quantity. This disease has been reported in many parts of the world where soybean are grown and climate is warm with frequent rain.(13)

IV. PROPOSED APPROCH.

The block diagram of proposed approach given is given below. Our aim is to identify the diseased plant by using content based image retrieval method. From the database the images are taken and features of the images are extracted. For this purpose we use one of the methods which are discussed below. System also gives the percentage of affected plant. Also it gives name of the disease by which the plant is affected and the necessary remedy is also provided by this system. The remedy contains the name of the pesticide, herbicide, or any natural method also.

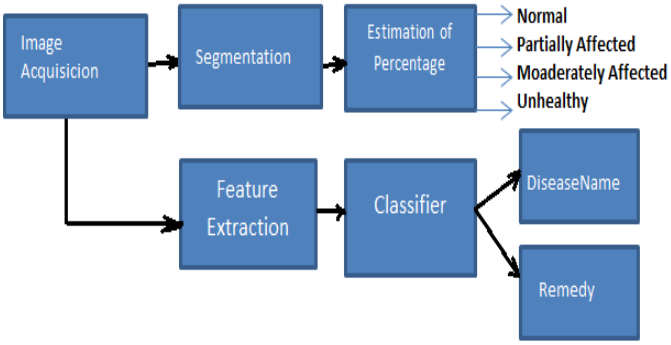

Fig. 5: Block Diagram of proposed approach

Some methods are discussed below to determine the disease plants.

1) Method - 1

This approach starts with the digital images for both the samples such as healthy leaf images and diseased leaf images. The images of the different plants which we have to examine are taken from environment. Once the database is acquired of healthy and infected images of samples, the image processing techniques are used to extract the useful features that are useful for the analysis of next phases.(12) After that, histogram comparisons are used to classify the images.

Proposed system of Kamaljot Singh Kailey et al is given below.

Algorithm**:**

1. Take two RGB image samples of a plant having unaffected and diseased leaves.
2. Separate the RGB image into red, green and blue layers. Convert RGB images to Grayscale images.
3. Apply CANNY'S edge detection technique on both samples
4. Generate the histograms of both the samples and save it in the database.
5. Now take the test sample RGB image, separate the red, green, blue layers. Convert it into gray scale image.
6. Generate the histogram of the test sample.
7. Compare the test sample with the healthy sample and with the infected (diseased) sample.
8. From the comparison we will get the test sample is diseased or not.

2) Method – II

This method is based on the ANN (Artificial Neural Network). In which the features are extracted from the images and these are fed to the ANN as input and the required image is retrieved.

Algorithm:

1. Create a database of the images which would be used for the training and testing purposes.
2. Extract the features of images by using The *Gabor filter* in step1 and store them in the database.
3. Take images of test sample.
4. Extract the features from the test sample images by using *Gabor filter* and store the features in the memory.

By using the ANN classification of images id done.

B. Gabor filter

A set of features are computed from the response of the image samples to the Gabor filters. They are unichannel features given by

$$e_{imn} = \sqrt{\left(\sum_{x,y} h_{imn}^{2}(x,y) \right)}$$

where „*e'* is the energy in the filtered image. The interchannel features between different spectral channels i and j with m and m‟ denoting the scales of the filters is computed as

$$o_{ijmm'n}^{2} = 2 - 2\underbrace{\sum_{x,y} \frac{h_{imn}(x,y)h_{jm'n}(x,y)}{e_{imn}e_{jm'n}}}_{c_{ijmm'n}}$$

Where Cijmm‟n is the zero offset normalized crosscorrelation between himn(x,y) and hjm‟n(x,y).

1) Method III

In this method of disease detection Jagdishpujari et al(6) used Runlengh matrix for feature extraction.

Here the percentage of affected area is calculated by using following equation.

Percentage = (Affected area/Total area)*100 (1)

Where, Affected area= Number of brown spots count

Total area = Total size of leaf, stem or fruit

The affected area is calculated by counting number of brown spots over total area on leaf, stem and ripe fruits.

The grading is performed based on percentage of affected area, whether image sample is normal, partially affected, moderately affected or unhealthy as shown below.
Less than 1% affected area = Normal
Less than or equal to 25% affected area = Partially affected
Less than or equal to 50% affected area = Moderately affected
More than 50% affected area = Unhealthy
Algorithm 1: Estimation of percentage of affected area.
Input: Image samples
Output: Percentage of affected area
Start
Step1: take image samples both normal and diseased by anthracnose
Step 2: Categorize the area affected (diseased) using segmentation techniques
Step 3: Calculate the percentage of affected area using Equation (1).
Step 4: If (percentage < 1)
Display 'normal'
Else if (percentage<=25)
Display 'partially affected
Else if (percentage<=50)
Display 'Moderately affected'
Else
Display 'Unhealthy'
Stop**.**
Algorithm 2: Development of Run length Matrix $Q\varphi(x, y)$ from the Image $f(x, y)$.
Input: Gray level image f(x, y) of size M*N
Output: Run length matrix $Q\varphi(x, y)$ in the direction φ.
Start
Step 1: Assign $Q\varphi(x, y) = 0$ for all x, y ε [0, L], L is the maximum gray level.
Step 2: Find the matrix $Q\varphi(x, y)$, for a given angle φ. The entry $Q(x, y)$ is the (x, y)th
entry in the Runlength matrix, where 'x' is the gray level and 'y' is the Runlength.
Stop.
Algorithm 3: Texture Feature Extraction
Input: RGB components of original image
Output: Texture features
Start
Step 1: For all the separated RGB components perform
Steps 2 thru Step 4.
Step 2: Derive the Run length Matrices $Q\varphi(x, y)$ for four different directions φ (00, 450, 900 and 1350).
Step 3: Compute the Run length matrix, independent of direction u.
Step 4: Five Run length matrix features namely RLN, GLN, LGRE, HGRE and RP are calculated.
Stop.

V. Conclusion And Future Scope

This paper proposes a simple model for disease detection. Content based image retrieval (CBIR) is efficient method for detecting the diseased plant. The development of good classification methods and precise features is very important in order to run the system in real time.

1. There is scope for development of efficient and fast interpreting algorithm.
2. Implementation of the proposed system.
3. There is scope to determine the type of disease.
4. There is future scope to determine the severity of the disease.
5. The work can be done to suggest the ways to control the disease.

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