Plant Pathogen Detection using Canny Edge Algorithm

P. Deepa
Electronics and communication Engineering
Angel College of Engineering and Technology
Tirupur, Tamil Nadu, India

M. Manojkumar
Electronics and communication Engineering
Angel College of Engineering and Technology
Tirupur, Tamil Nadu, India

R. Narmadadevi
Electronics and communication Engineering
Angel College of Engineering and Technology
Tirupur, Tamil Nadu, India

L. Shamli
Electronics and communication Engineering
Angel College of Engineering and Technology
Tirupur, Tamil Nadu, India

Abstract:- **The detection of disease on the plant is a very essential key to have high yield production.The white spot symptoms are observed on the leaf.The identification of disease in manual manner which can consume more days for observation.The aim of the project is to identify the disease accurately and medicines are recommended for the zaid crops from the leaf images.The steps required in the process are preprocessing, training and identification.The disease considered is Powdery Mildew which can cause heavy loss to zaidcrops.The features are extracted from leaf and given to the classifier for the classification purpose.**

Keywords — White spot,Canny edge detection,deepneural,k mean clustering.

I. INTRODUCTION

Agriculture is the foremost important thing by which natural ecosystems are transformed into ones devoted to the production of food. In recent days,the smart farming has been evolved in controlling and monitoring the field conditions using self operating system. The self recognition of the disease is based on the identification of the symptoms of disease. Therefore in field of agriculture, detection of disease in plants plays an important role.The existing method for plant disease detection is simply naked eye observation by experts through which identification and detection of plant disease is done.To detect the plant disease in very initial stage, use of automatic disease detection technique is beneficial. This in turn reduces the monitoring of large field by human being. In disease recognition from image the key is to extract the characteristic feature of the diseased region. According to the disease the features may vary. The features that are extracted from the image are color,shape,textureetc.Sometimes for detection of the disease more features are extracted . The occurrence of the disease on the plant may result in significant loss in both quality as well as the quantity of agricultural product. This can produce the negative impact on the countries whose economies are primarily dependent on the agriculture. Hence the detection of the disease in the earlier stages is very important to avoid the loss in terms of quality, quantity and finance. Usually the methods that are adopted for monitoring and management of plant leaf disease are manual. One such major approach is naked eye observation. But the requirement of this method is continuous monitoring of the field by a person having superior knowledge about the plants and its corresponding diseases.To appoint a person to look after it,it add cost and to hear the advice of expert in detecting the disease may add extra cost.If the expert is not available it leads to loss in production.The diseases are diagonised in laboratory using testing methods.But it requires professional knowledge in testing. The pathogen detection methods can provide more accurate results. As the tests are carried out of field the cost may be high and could be time consuming. This paper suggests a system which can provide more accurate results related to the identification and classification of disease. It tries to replace the need of the experts to certain extent. Here, the captured image is first preprocessed to resize it and then converted to HSI color space format by using segmentation. The features such as major axis, minor axis, eccentricity are extracted from the image. In the last step, these features are given to the classifier to classify the disease occurred on the leaf.

POWDERY MILDEW:

Powdery Mildew is a fungal disease that affects the wide range of plants.Powdery Mildew diseases are caused by many different species of fungi in the order of *Erysiphales*,with*Podosphaeraxanthii*being themost commonlyreported*cause*.Infected plants display white powdery spots on the leaves and the stems.The lower leaves are the most affected, but the mildew can appear on any ground part of the plant.As the disease progresses,these spots gets larger and denser as large number of asexual spores are formed and mildew may spread up and down the length of the plant.Powdery mildew grows well in environments with high humidity and moderate temperatures.In an agricultural setting, the pathogen can be controlled using chemical methods,genetic resistance, and careful forming methods.It is important to be aware of powdery mildew and its management as the resulting disease can significantly reduce crop yields affected with powdery mildew is shown below in Figure1.

Figure1:infected leaf with powderymildew

Figure2:infected leaf

III.METHODS AND METHODOLOGY :

This section explains in detail about the methods and methodology adopted.

A.DATABASE CREATION:

This database contains the powdery mildew disease infected leaves of the zaid crops like pumpkin. These images were captured by camera model DSC T-90 of Sony Company. All the images are in JPEG format and were taken from farm in kuniyamuthur.

B. Design of the system

The methodology adopted for the system is shown in Figure 3 below.

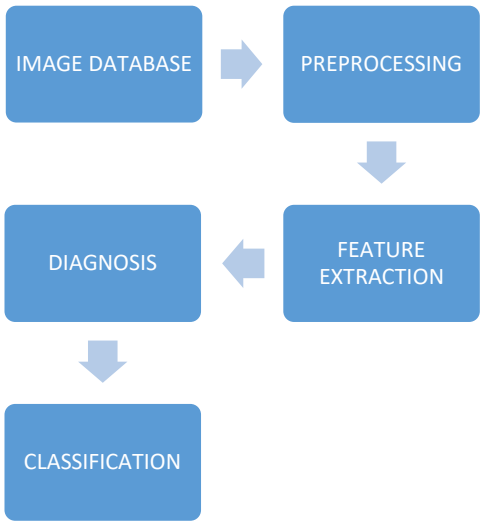


Figure 3: Flow of system

At first the damaged image should be pre-processed.

PREPROCESSING:

This preprocessing can reduce the influence made by the background. The image enhancement consists of following steps Transformation of the defected image into HSI colour space. Analysing the histogram of the intensity channel to get the threshold by which we can increase the contrast of the image. Adjust the intensity of the image by applying thresholds.

C. Feature Extraction:

Features are extracted from image using Gabor filtering method and canny edge detection method. These features are very important for the colour and morphology of the leaf spots and they provide critical information about its visual representation. The features correspond to colour characteristics are the mean and variance of the gray level of the red, green and blue channel of the spots; and other features correspond to morphological and geometrical characteristics of the spots. It is assumed the shape of leaf is identical to the ellipse

Length and ratio of principal axes:

Major and Minor axes length is the length of the major and Minor axes of the ellipse that has the same normalized second Inertia moments as the spot, and ratio of principal axes length is major axis length divided by Minor axis length

***2) Centre of Gravity*:** For a spot surface described by function f(x,y) consisting of N pixels, the centre of gravity coordinates (x,y) can be calculated as:
$\bar{x} = 1\ N \sum \bar{x}, \bar{} = 1\ N \sum y^{-}$

***3)Moments of Inertia*:** The moments of inertia for an spot described as f (x,y) can be defined as:

$\mu pq = \iint (xy) xpRyqdxdy$ where p,q=0.1.2…….. in the binary images

4)Orientation: Orientation is defined as the angle between the major axis of spot and the horizontal axis. Because the major axis exhibiting the minimum moment of inertia, it can be calculated as: $\theta = 1\ 2\ arc\tan(\ 2\mu 1{,}1\ \mu 2{,}0 - \mu 2{,}0\ )$

***5) Eccentricity*:** The ratio of the distance between the foci and major axis length of the ellipse that has the same second-moments as the spot, also called circularity ratio. Its value is between 0 and 1, the spot whose eccentricity ratio is 0 is actually a circle, while the spot whose eccentricity ratio is 1 is a line.

D. Classification:

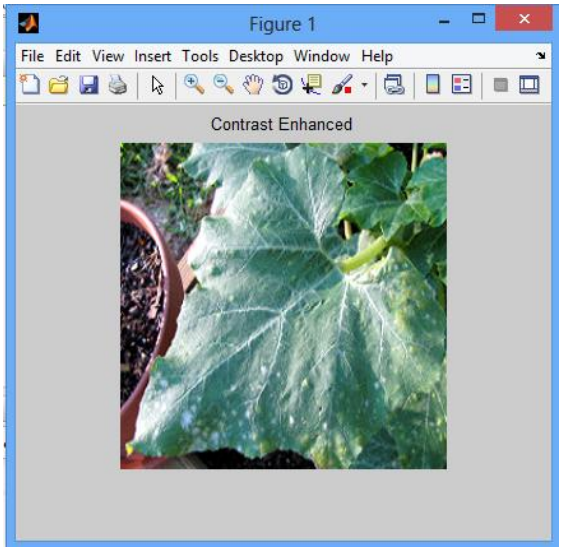
The features extracted are used for classification of the disease. For classification purpose Deep Neural Network is

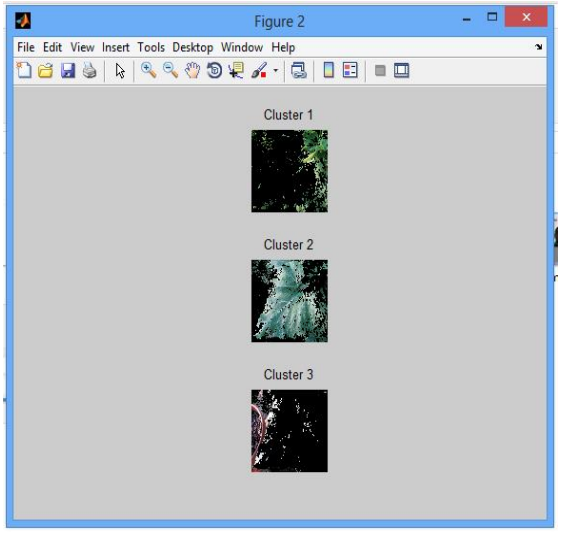
used. After training the samples in the database the disease is classified as Powdery Mildew.

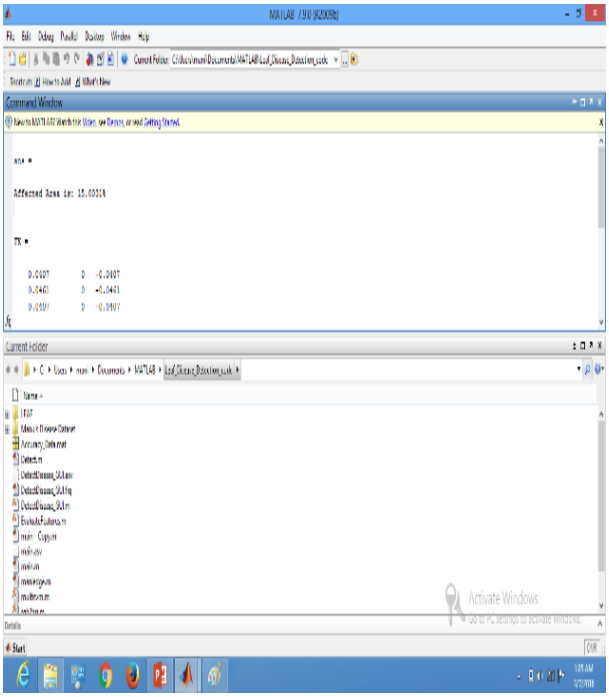
IV. RESULTS OF SEGMENTATION

The segmentation is based on two principles-discontinuity and similarity. Discontinuity extracts the regions having different properties like intensity, colour, texture etc. Similarity groups the image pixels into groups with some predefined criteria.3pixel similarity with the neighbouring pixel, the algorithm used is region based. In leaf disease identification, segmentation is used to identify the diseased area. From this, features of a region are computed. Figure 5 shows the results of the segmentation for extracting spot features.

OUTPUT:







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