A Survey on Identification of Plant Diseases

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***ABSTRACT** – Plant Disease identification is an interesting area in agriculture field research.It includes identifying the disease using machine learning technique which proved to be a prominent plant disease system. These paper presents a survey of different plant disease an types of classifers which classify the disease. Plant disease identification and detection is possible through image processing techniques. The system process input image and compare it with trained data set. Later, classifer classifies the type of plant disease. There are various classifers available like K-Mean, Support Vector Machine, K-Nearest neighbour, etc[1].*
KEYWORDS - Plant disease, image processing.

INTRODUCTION

India is a nation where agriculture is the prime occupation. Farmers have various options to select suitable Fruit and Vegetable crops. The cultivation of these crops for optimum yield and quality produce is highly technical. Considering today's condition with outbreak in plant diseases, making it is very important to keep a check on plant diseases. Thus there is a need of technology which can be used to detect if the plant is affected by any disease. The system uses image processing; wherein the leaf image of the plant will be processed and compared with the trained dataset. It includes various steps like image acquisition, image processing, image segmentation, image recognition or classification. It can be on the basis of various image classification approaches on the basis of characteristics used or training sample used or assumption of parameter on data or pixel information used or on the basis of number of outputs for each spatial element. There are various classifiers like SVM, ANN, Fussy Logic, k-means, KNN, artificial neural network, etc.[1]

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

1. It can be used to detect diseased leaves, stem and fruits in various plants.
2. It is uesd to quantify the area affected by disease.
3. It can be used to find the shape of affected area.
4. Colour of affected area can also be determined.
5. It can be used to determine size and shape of fruits.

It includes various steps like image acquisition, image processing, image segmentation, image recognition or classification.
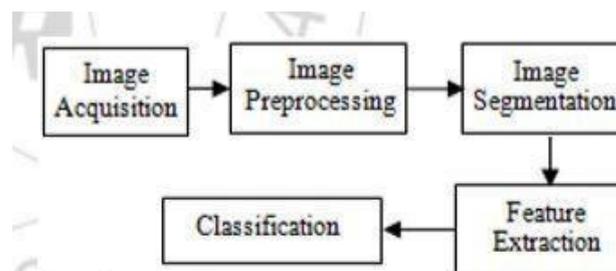

Fig. 1 – Flow Diagram

〕   Image Acquisition:

The first step in image processing is image acquisition. It includes data collection, which is actual source image, that needs to be processed. There are various ways to acquire digital images of plants. It can be done by using camera which depends on the need. Different cameras that can be used are 3M pixel real color camera, Kodak DC50 zoom camera, Olympus wide zoom camera, Nikon Coolpix P4 digital camera, and Panasonic DMCLX1camera[1]. In agriculture, the images of the plant leaf are captured through the camera in a controlled background and are stored.

〕   Image processing:

Image processing specify to work on images in order to convert it into better image which the algorithm can work on.

It includes resizing, croping, filtering of image. For filtering various algorithm are used such as Han filter, median filter, etc[9].

〕   Image Segmentation :

It consists of extracting different image attributes of an original image. In this image is divided into constituent regions or objects. The level to which that subdivision carried out is a problem specific. The simplest method among all segmentation methods is threshold-based method[10]. In this, first the histogram of the image is computed then a particular value of threshold like intensity is selected to segment the region.

〕   Feature Extraction:

Feature extraction is a technique to extract relevant features from plant leaf. Features like colour space of image, edge detection are used.To arrive at the decision and identification, the result from feature extraction are classified[8].

〕   Classification:

Classification is a common process to recognize image. Classification is needed to distinguish a plant species withother species based on the data obtained from feature selection. The descriptors from the image data is stored in database and compared with the descriptors from the query image. The closer gap within those descriptors is then chosen to appoint the query image to be in which class. There are various techniques used for classification[1]. There are various classifers available like K-Mean, Support Vector Machine, K-Nearest neighbour, etc[1].

PLANT DISEASES

The crop yield depends on various factors. One of the most important factor that affects the yield is plant diseases. According to Michigan State University, around 85 percent plant diseases are caused by fungal or fungal-like organisms.
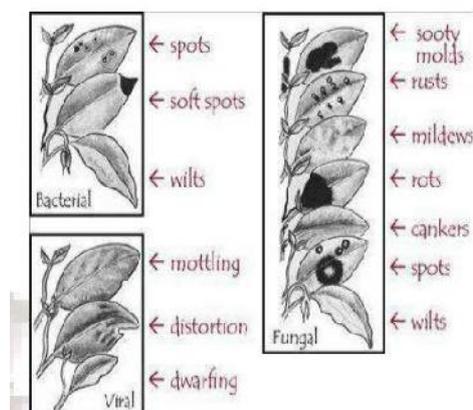

Fig. 2- Types of plant diseases.

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 8
August 2017

However, other serious diseases of food and feed crops are caused by viral and bacterial organisms. Some plant diseases are classified as "abiotic," or diseases that are non-infectious and include damage from air pollution, nutritional deficiencies or toxicities, and grow under less than optimal conditions[7]. Basically there are three categories of plant diseases: fungal, bacterial and viral. If plant disease is suspected, careful attention to plant appearance can give a good clue regarding the type of pathogen involved[7].

Fungal disease signs:

) Leaf rust (common leaf rust in corn)

) Stem rust (wheat stem rust)

) Sclerotinia (white mold)

) Powdery mildew

Fungal disease symptoms:

) Birds-eye spot on berries (anthracnose)

) Damping off of seedlings (phytophthora)

) Leaf spot (septoria brown spot)

) Chlorosis (yellowing of leaves)

Bacterial disease signs:

) Bacterial ooze

) Water-soaked lesions

) Bacterial streaming in water from a cut stem

Bacterial disease symptoms:

) Leaf spot with yellow halo

) Fruit spot

) Canker

) Crown gall

) Sheperd's crook stem ends on woody plants

Viral disease signs:

) None

Viral disease symptoms:

) Mosaic leaf pattern

) Crinkled leaves

) Yellowed leaves

) Plant stunting

LITERATURE SURVEY

In research article [1], the authors studied various image classification approaches and different classifiers like clustering method, Artificial Neural Network, Support Vector Machine along with the various steps in image processing.

[2] In this paper the authors provide an overview of different classification techniques that are used for plant leaf disease classification.

In this paper [3], they identify the plant leaves. Further, their work proposed a comparison of supervised classification of plant leaves, and used seven different species for the study. To detect the plant diseases, they

used three features like a finescale margin feature histogram, by a Centroid Contour Distance Curve shape signature, and by an interior texture feature histogram, extracted from binary masks of these leaves.

This paper [4], presents a survey on different diseases classification techniques used for automatic detection of plant diseases in its early stages.

Samuel E. Buttrey and Ciril Karo [5], constructed a hybrid classifier by combining two classifiers-classification trees and k-nearest-neighbor. In this they divided the feature space up by a classification tree, and then classified test set items using the k-NN rule which reduced the computational load associated with k-NN, and produced a classification rule that performs better than either trees or the usual k-NN in a number of well-known data sets.

[6] In this paper by Sanjay B. Patil, Dr. Shrikant K. Bodhe, they analysed fungi caused diseases in sugarcane. They found that excess use of pesticides increase the cost of yield which can be avoided by knowing the severity of disease. The accuracy of the experiment was found to be 98.60 %.

[8] In this paper, they have discussed about existing segmentation method along with classifiers for detection of diseases in Monocot and Dicot family plant. They studied and evaluated existing techniques for detection of plant diseases to get clear outlook about the techniques and methodologies followed. The detection of plant disease is based on type of family plants and is carried out in two phases as segmentation and classification.

[9] This paper describes various image filtering algorithms and techniques used for image filtering/smoothing.

CONCLUSION

This paper presents a review on various plant disease and techniques used to classify the disease. According to survey, image processing is used for disease identification. Thus, there is need of a system that can be used to detect diseases in a plant using image processing. That is a technology which can be used to detect if the plant is affected by any disease. The system will use image processing; wherein the leaf image of the plant will be processed and compared with the trained dataset. It includes various steps like image acquisition, image processing, image segmentation, image recognition or classification. It can be on the basis of various image classification approaches on the basis of characteristics used or training sample used or assumption of parameter on data or pixel information used or on the basis of number of outputs for each spatial element. There are various classifiers like SVM, ANN, Fussy Logic, k-means, KNN, artificial neural network, etc.

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