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Identification and Classification of Cotton Leaf Spot Diseases using SVM Classifier

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Abstract – **Plant diseases may cause many losses to agricultural crops around the world. Therefore methods for identification of disease found in any part of the plant play a critical role in disease management. Now a days the many aspects of the crop development process uses the Advance Computing Technology that has been developed to helps the farmer to take superior decision about the crop. Evaluating & diagnosing the crop diseases is critical in the field of agriculture to increase the crop productivity. The new technological strategies are used to express the captured symptoms of cotton leaf spot images and Algorithms are used to categorize the image. In this proposed work all the images are converted into standard resolution, pre-processed and stored in the database. The classifier is being trained to achieve intelligent farming, including early Identification of diseases. The mobile captured image will be pre-processed and Edge detection algorithm is applied to the pre-processed image. Then the segmentation technique such as k-means clustering will be applied and features like colour, shape and texture features are extracted. Finally support vector machine classifier is used to identify the Diseases comparing with the trained dataset.**

Keywords- **RGB image, Cotton leaf disease spots, SVM classifier**

1. INTRODUCTION

The history of machine vision technology is relatively young and the origin of this can be traced back to the 1960's of the years. Over the years, for both in theory and applications it has experienced tremendous growth. So that it has found application in the areas such as medical field, manufacturing, aerial surveillance, remote sensing and agricultural areas. Computer vision is a novel technology for acquisition of an image and analyzing an image of real scene by computers and other devices in order to control machines or to obtain information and processes. Computer vision includes the capturing of an image, processing of an image and analyzing images to facilitate the objectives and non-destructive assessment of visual quality. The present era is moving highly towards automation. The Novel technology like Computer vision with its advanced technology is successfully used for classification of plants, recognition of leaves and diagnosis of plant diseases.

India is an agricultural country; so that the population mainly depend on agriculture. The 70% of the population depends on agriculture. Today, in farm output

India ranks second worldwide. Agriculture is still the largest economic sector and plays a major role in socio-economical development of india. Agriculture in India is the means of livelihood and its almost two-third of the workforce in india. Crop cultivation depends mainly on rainfall, soil quality and climatic conditions and the failure of these may lead to the loss of crop. Diseases are major reasons for loss of crop every year and it is challenge to farmers to control the diseases. Computer vision systems would help to tackle this problem to farmers.

Cotton is the " The White Gold" or the "King of Fibers". Among all cash crops in the country cotton has the rich status and for flourishing textile industry it considered as a principal raw material. It provides livelihood to about sixty million people and is an important agricultural crop and it provides rich income to millions of farmers both in developed and developing countries. Cotton is a crop of warm climate and requires a regular supply of water either naturally in the form of rainfall or assured through canals from the above surface and/or from underground sources. Although cotton is not a water loving plant. For maintaining growth and balance between vegetative and reproductive phase it requires a regular supply of water. About fifty five percentages of the world cotton area are under irrigation and the balance is rain fed.

Various types of cotton leaf spot diseases

- Grew mildew
- Alterneria leaf spot
- Bactreial blight
- Rust
- Leaf Curl virus disease etc

Symptoms of Cotton Diseases

- Grey mildew

The disease usually appears on the under surface of the lower leaves when the crop is nearing maturity. Irregular to angular pale translucent lesions which measure 1-10 mm (usually 3-4 mm) develop on the lower surface, usually bound by veinlets. On the upper surface, the lesions appear as light green or yellow green specks. Whitish grey or frosty powdery growth, consisting of conidiophores of the fungus, appears on the lower surface. When several spots coalesce, the entire leaf surface is covered by white to grey powdery growth. The infection spreads to upper leaves and entire plant may be affected. The affected leaves dry up from margin, turn yellowish brown and fall off prematurely.

- Rust

Most common symptom is the appearance of bright yellow orange spots usually on under surface of the lower leaves. These pustules are surrounded by purple borders. Spots become brown with age. Spots may appear on any of the above ground parts including bracts and bolls. Severe infections may cause defoliation and reduction in the size of the bolls.

- Bacterial Blight

Dark green, water soaked, angular lesions of 1 to 5 mm across the leaves and bracts, especially on the under surface of leaves. Hence called angular leaf spot. Sometimes it will dark green, water soaked lesions along the veins known as vein blight. Symptoms are usually more prevalent on lower leaves than on upper leaves.

- Alternaria leaf spot

The disease may occur in all stages but more severe when plants are 45-60 days old. Small brown, round spots surrounded by a purple margin appear on leaves. On older leaves the necrotic center of the spots may be marked by a pattern of concentric zonation. Several spots coalesce together to form blighted areas. Under humid weather conditions the spots appear as sooty black leading to premature defoliation. Sometimes stem lesions are also seen. In severe cases, the leaf stalk and bolls become infected with spherical or elliptical purple spots

2. RELATED WORK

Plant disease is one of the crucial causes that reduces quantity of products and degrades quality of the agricultural products. The ability of disease diagnosis in earlier stage is very important task. There are numerous characteristics and behaviours of such plant diseases in which many of them are merely distinguishable. Hence an intelligent decision support system for Prevention and Control of plant diseases is needed which is an integrated agricultural information platform, that uses some high-tech and practical technology, such as fuzzy logic, neural networks, support vector machines and such other soft computing techniques to appropriately detect and diagnose the plant diseases.

The Advance computing technology , it is developed to helpthe farmer take the decision about the crop development process. Here it uses the new technological stratergies to capture the cotton leaf images and categorizes the disease using HPCCDD algorithm[1]. The Edge detection algorithms are used to find out the edges of affected area of the leaf. For classification the Neural network is used. The RGB color and texture features are extracted for the diseased spots to recognize disease.

The feature selection affects the design & performance of the classifier. Here they are using the fuzzy feature selection approach -fuzzy curves (FC) and surfaces (FS) – [2] is proposed to select features of cotton disease leaves image. Fuzzy curve are the nonlinear continues curve, which establishes a connection between a specific input and the output, performing a projection of the multidimensional input and output space on the probed input-output space. Fuzzy surface is an extension of fuzzy curve it is an Independent feature do a better job of approximating the output than dependent inputs . Fuzzy surface can be thought of as a “two-dimensional” fuzzy curve.

Plant disease identification based on image processing could accurately and quickly provide useful information for the prediction and control of plant diseases.The color, shape and texture features are extracted for classification. The back propagation Neural[3] network is used to classify the disease. The principle component analysis is used to reduce the dimensionality of the image.

The automatic computation is used to identify the cotton leaf spot diseases. The trained dataset images features are compared with the all the extracted features like color, shape and texture features using the PSO feature selection method. The Cross Information Gain Deep forward Neural Network (CIGDFNN) classifier [4] is used for the classification.The skew divergence feature are calculated by color histogram and skew divergence of texture features are calculated by using gober filter and Shape skew divergence are calculated by using sobel and canny methods.

Identifying and diagnosing the cotton leaf disease, the leaf may have different colors for different disease. So that analyzing the color of the disease and also have different features like shape and all. Using the information about shape of the disease spot of image [5]and holes are present on the leaf of the image are considered for identification and classification of disease.

The Support Vector Machine (SVM) is a state-of-the-art classification method introduced in 1992 by Boser, Guyon, and Vapnik [6]. The SVM classifier is widely used in bioinformatics (and other disciplines) due to its high accuracy, ability to deal with high-dimensional data such as gene expression, and exibility in modeling diverse sources of data. SVMs belong to the general category of kernel methods

[6]. A kernel method is an algorithm that depends on the data only through dot-products. When this is the case, the dot product can be replaced by a kernel function which computes a dot product in some possibly high dimensional feature space. This has two advantages: First, the ability to generate non-linear decision boundaries using methods designed for linear classifiers. Second, the use of kernel functions allows the user to apply a classifier to data that have no obvious x-dimensional vector space representation.

In agriculture research of automatic leaf disease detection is essential research topic as it may prove benefits in monitoring large fields of crops, and thus automatically detect symptoms of disease as soon as they appear on plant leaves[7]. The term disease is usually used only for destruction of live plants. The image processing methods are used for increasing throughput and reduction subjectiveness arising from human experts in detecting the leaf disease. Digital image processing is a technique used for enhancement of the image.

Automatic classification of plant diseases at an early stage is vital for precision crop protection. Cercospora beticola, the agent of Cercospora leaf spot[8], is the major fungal leaf pathogen in sugar beet production. Cercospora beticola causes a reduction of yield quantity and quality, with economical losses. The support vector machine is the one of the best classification technique.

3. ARCHITECHTURE

In this Section the detailed working system architecture of the proposed system is shown.

The Figure 3 architecture contains the image processing techniques , the mobile captured image will be undergoes some of the pre-processed techniques such as acquisition of an image, resizing of an image and converting the color image into grayscale image. some analytical perceptive techniques are used to classify the images according to the specific problem so that the sobel and canny Edge detection algorithms are applied to the pre-processed image to get the edges of the diseased spot area. Segmentation of the image will be takes place using k-means clustering algorithm. Features like color, shape and texture features are extracted from the segmented image. Finally the SVM classifier is used to identify the disease comparing with the trained dataset.

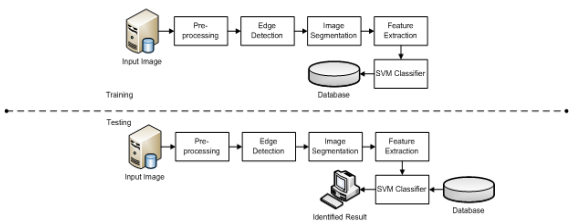

Figure -3 Architecture

Proposed Algorithm:

The proposed algorithm contains the some of the image processing steps.

1.Captured image acquisition
2.Resizing an image into standard resolution
3.Converting RGB image into Grayscale image
4.Detecting the edges of the diseased spot of leaf
5.Segmentation of an image
6. Color,shape and texture features are extracted
7.support vector machine classifier is used to train and test the image.
8.Compare the result with trained dataset
9.image result outputted

4. METHODOLOGY

In recent agriculture system ,the Advance computing technology has been developed to monitoring the proper development of crops in the fields. But in the early agricultural system , the observation of crops by farmer itself is challenging task. Without having the good knowledge about disease symptoms finding the disease by eye observation may lead to the loss of crops. Even to consult the expertise is too cost and time consuming. So that here proposing the advanced method for identification and classification of cotton leaf spot diseases. Figure-3 shows the Advance computing Architecture to identify the disease.

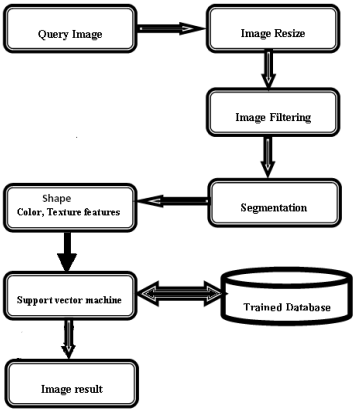

Figure- 4 Advance computing system Architecture

6. CONCLUSION

The goal of this work is to develop an Advance Computing system that can identify the disease affected part of a cotton leaf spot by using the image analysis technique. The producers can amend the Yield and reduce the loss. Through this proposed system the farmers' burden has been reduced and saves their life. This work consist of mobile captured image will be preprocessed . Edge detection algorithm is applied to the pre-processed imge. The segmentation technique such as k-means clustering will be

applied and features like color, shap and texture features are extracted. Finally support vector machine classifier is used to identify the Diseases.

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