Real-Time Detection of Anthracnose Disease Using C++ and MATLAB Tools

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ABSTRACT

— Physical recognition of defected fruits is very difficult. These days, the existing system has the drawback of low speed, low efficiency, high cost and complexity. The identification of diseases on fruits is the major factor for reduces the diseases on fruits and thereby increasing the productivity. The symptoms can be observed as spots or lesions on fruits and Its effect will diminish the quantity and quality of fruit, as it reduces the photosynthesis process. The system uses openCV to monitor the diseases on fruits and the steps for the resulting system are image acquisition, Image preprocessing, Image segmentation, Feature extraction and detection and classification of disease.

Keywords: Detection, Anthracnose, Classification, Segmentation

I. INTRODUCTION

Anthracnose is a group of fungal diseases that affect a variety of plants in warm, humid areas. It is commonly infecting the developing shoots and leaves, anthracnose fungi (usually Colletotrichum or Gloeosporium) produce spores in tiny, sunken, saucer-shaped fruiting bodies known as acervuli. It produces dark, sunken lesions on leaves, stems, flowers and fruits. It can spread during rainy seasons. On leaves, anthracnose generally appears first as small, irregular yellow or brown spots. On fruits, it produces small, dark, sunken spots, which may spread. In moist weather, pinkish spore masses form in the center of these spots. Eventually, the fruits will rot. Anthracnose diseases may infect leaves, twigs, buds, shoots and even the fruit of various landscape trees, Repeated Anthracnose infections can weaken a tree and cause it to be more susceptible to attack by insect pests or to decline due to adverse environmental conditions.

Fig 1 : Anthracnose affected fruit

Anthracnose spores overwinter on fruits, on infected buds, and in cankers on infected twigs. In the spring these spores are blown or splashed onto newly emerged fruit .If the winter is cool and moist the spores will germinate and infect the fruit. The position of any country in the world depends on its economy which in turn depends on agricultural production in many countries like India. Also in India most of the population depends on agriculture for a livelihood. The quality and quantity of the agricultural production is affected by environmental parameters like rain, temperature and other weather parameters which are beyond the control of human beings. Anthracnose has a large possibility to decrease the agricultural production significantly. For a country like India whose major occupation is agriculture, it is necessary to prevent crops from getting affected or try to detect and treat crops affected by Anthracnose.

The segmentation is based on two principles-discontinuity and similarity. Discontinuity extracts the regions having different properties like intensity, color, texture etc. Similarity groups the image pixels into groups with some predefined criteria. Based on pixel similarity with the neighboring pixel, the algorithm used is region based. In leaf

disease identification, segmentation is used to identify the diseased area [1]. Thresholding is a most commonly used technique for segmentation. The main drawback with this technique is setting the correct value of threshold which affects the accuracy of the result. Existing algorithms have used intensity as a parameter to predict the percentage of affected area [2]. In [3],automatic detection and classification of diseases are discussed. Plant disease spots are different in color but nit in intensity. Thus color transform of RGB image is used for better segmentation of disease spots. Median filter is used for image smoothing and Otsu method is used to calculate threshold values to detect the disease spot. It doesn't give accurate result for Dicot family plant.

II. PROPOSED METHOD

The block diagram of the proposed method is shown in the Fig. 2.

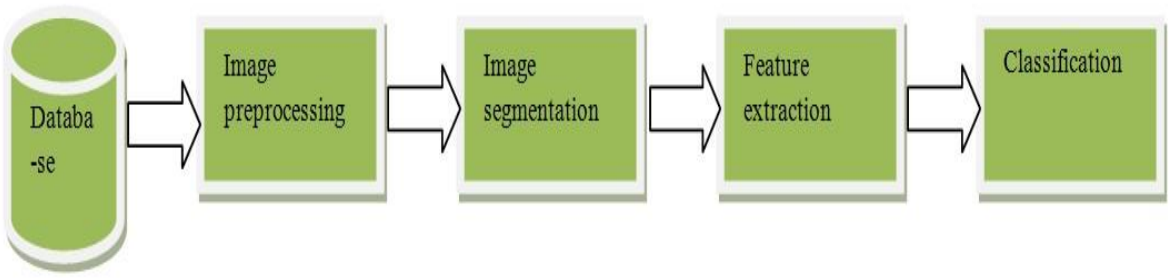

Fig 2: Block Diagram

Image Acquisition
Image acquisition is the first step which consists of two stages. The stages are image enhancement and image preprocessing. Image acquisition is a method in which storing of an image or collecting the relevant data . Image acquisition is the initial condition for the work flow series of image processing because processing is possible only with the help of an image.

Algorithm
1. Read the image I
2. Set the threshold T
3. Size(m,n)=determine the size of the image I
4. For (i=1 to m)
5. For (j=1 to n)
X=Determine the intensity (i,j)
Segment the pixel
End
End
5. Determine the area of all the spots
6. Determine the perimeter of all the spots

Segmentation Stage
Image segmentation is the method at which digital image is segregated into several segments. The aim of the segmentation is to convert the image into relevant information for easy analysis. It is done by segmenting the images into several pixels.

Pixels is on the form of n*n matrix. The aim of the segmentation is to optimize the partitioning decisions. Segmentation is done based on threshold value.

Fig 3a: Input image

Fig 3b:Grey Scale image

Fig 3c:Segmented image

Feature Extraction

Third stage of the proposed method is feature extraction. Features are extracted from the fruit. Color and Shape features are extracted in feature extraction. Area, perimeter was obtained from binary segmentation. Color segmentation image is used for extracting color features and texture features.

Classification Stage

Classification of defected fruit is determined based on threshold value.

III. RESULTS AND ANALYSIS

Area and defected percentage of affected fruit using matlab and C^{++} programming with openCV is shown in table1. In this project, 3 samples are taken: Orange, Banana and Apple. The pixel size of orange, banana and apple is 240*240, 800*533, 1300*951 respectively. The Matlab is purely software based image processing and C^{++} programming using openCV and is based on software and hardware.

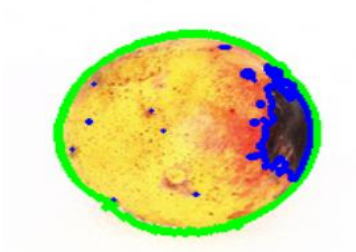

Fig 4: Defected portion detected

FRUIT	DEFECTED PERCENTAGE		
	ORANGE	BANANA	APPLE
C++ Programming using openCV(Qt Creator 4.2.1)	9.39	42.2633	59.8441
Matlab(R2013a)	12.2014	45.7162	63.5055

IV. CONCLUSION

With the help of cultural practices, the farmer can reduce the disease only up to some extent. Therefore a novel approach can be used to detect Anthracnose disease by using image processing and embedded system. Through this method, area and percentage of affected part can be calculated. An image processing based approach is proposed and evaluated in this paper for fruit disease identification problem.

Thresholding technique is used for segmentation. Accuracy can be varied when we do not set the correct threshold value. Nowadays algorithms used intensity as the parameter. But in this paper ,Thresholding is used as the parameter. Area, perimeter of the affected fruits are taken additionally. The affected percentage of the affected fruits are taken by using the parameters such as area and perimeter.

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