Identification and detection of Maize leaf disease using advanced machine vision technology

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ABSTRACT

Maize is an important food crop for human being. The various fungi, virus and bacterial infection attack plant growth and decrease the quantity of agricultural product. So, it requires automatic plant disease identification from early symptoms. Therefore, image processing techniques involved to identify maize diseases from major loss. This paper presents image processing techniques in agriculture. Based on the images of color, texture and shape the features were extracted. Finally, those features were submitted for final classification. This result helps the farmer to predict the disease from early symptoms.

1. INTRODUCTION

Large portion of the Indian peoples highly depends on agriculture[1]. Today's economy highly depends on agriculture. One of the most stable foods for human being is maize called queen of cereals. Maize plays an important role of basic food raw materials for major industrial product like pharmaceutical products, food products and cosmetics items. At the same, disease causes major loss in maize plant to decrease agriculture production [5]. With relevant to maize, Maydis leaf blight and Maize common rust are the major yield loss disease in maize plant [8].

1.1 Maydis leaf blight:

Fig.1 Maydis leaf blight infection in maize plant.

Maize leaf blight is caused by fungus ascomycete Bipolaris maydis. Due to the changes of different environmental condition like warm and wet temperate the disease occurs gradually from the leaf and it reported losses upto 70% of the field. The symptom of the disease initially occurred from center of the leaf like small tan lesions in the vein of leaves shows in fig.1. Later, this pathogen will cause different isolated size in all over the leaf.

1.2 Maize common rust:

Fig. 2 Infected leaves of Maize plant.

Maize common rust is caused by fungus puccinia sorgi. The symptom of the disease gradually occurs like small tan raised spots in both side of the leaves. This disease mostly occurs in younger leaves other than mature leaves. The batched gradually occurs early stage of the plant and atlast it destroy 70% of the yield loss.

1.3 Importance of image processing:

Diagnosing the diseases in early symptoms is a consistent task in agriculture application. Because, the disease in plants makes a major yield loss from increase productivity. So, Continuous monitoring of farmers might be time consuming and wrong diagnosis from the confused symptoms. Therefore, automatic detection is needed to protect from early symptoms using the tool MATLAB [9]. The main characteristic of plant disease identification is accuracy and time consuming [6]. So, there is need of image processing technique to identify the disease from early symptoms. Fig.3 shows the architecture of image processing.

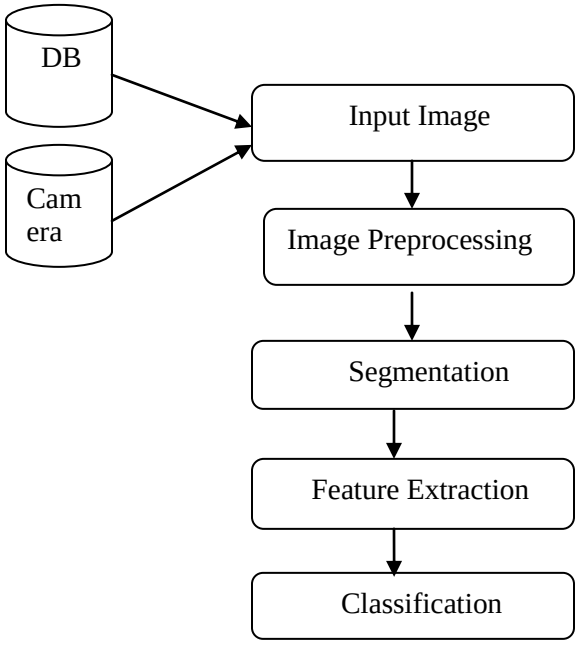


Fig.3 Architecture of image processing

2. RELATED WORKS:

In agriculture application, various researchers have proved image processing plays a vital role to detect plant disease from early symptoms.

Shi Yun et al. developed an algorithm to identify the disease of cucumber plant leaves. First, the samples of 50 images were collected from direct field through digital camera. Next, region based algorithm used to partition the leaves to detect diseased spot using segmentation method. At last, based on the experiment result PNN classifier used to differentiate the different types of diseases from early symptoms[2].

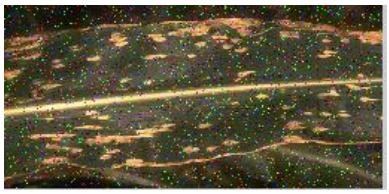
D.G. Sena Jr et. al. differentiate the damaged and non-damaged maize plant disease from eight different stages. The algorithm starts by two stages: First binary images were created for segmentation process. In second stage, the blocks are subdivided to store classified images to differentiate the damaged and non-damaged leaves. At last, based on 720 images the accuracy level goes upto 94%[3].

Jun Pang et. al. presents automatic identification of disease from early symptoms of corn leaves. Local threshold algorithm used to segment the infected portion from the image. The R-channel gray level and G-channel gray level pixels were identified for region growing rule set. At last threshold values were calculated by using LTSRG algorithm. At last, the author proved that LTSRG algorithm used to segment the disease effectively compared to other methods[4].

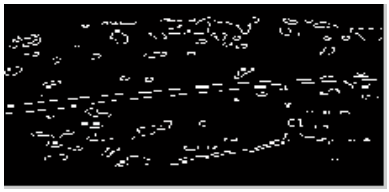
3. RESULTS AND DISCUSSION:

First, the Input images were taken from direct field using a digital camera and some of the images collected from benchmark database of plant village site. Next, some of the images were not clear because of sunlight and climate condition. So, preprocessing techniques applied to filter unwanted noise[8] After preprocessed, to extract the meaningful information the foreground and background images are divided by segmentation process of K-means clustering. Then, to identify the two different classes the feature extraction applied to identify the number of features from shape, color and texture [10]. At last, Support vector machine (SVM) applied to classify the different types of disease[7] show in Fig.4 and Fig.5

A: The input image of Maydis leaf blight



B: The Noisy Image of Maydis leaf blight



C. The Edge detection of Maydis leaf blight

D: the infected region of Maydis leaf blight

E. The input image of Maize rust

F. The Noise image of Mize rust.

G. The Edge detection of Maize rust

H. The infected region of Maize rust

Fig.4 Different Stage of infected plant

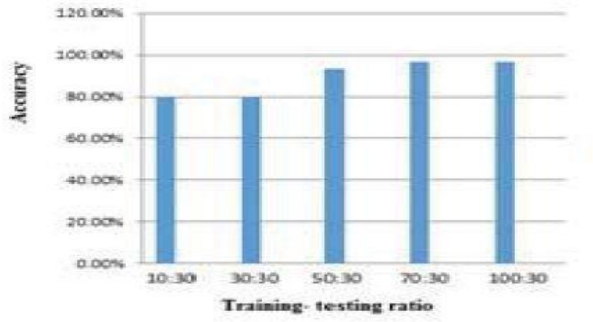


Fig 5. Final Accuracy

4. CONCLUSION:

The naked eye observation of agriculture field makes slow process in large basis. So, image processing techniques proves that automatic identification helps the farmers from major yield loss. Therefore, 40 images from real field and 80 images from plant village site totally 120 images were reported in Maydis leaf blight and Maize common rust of maize plant to detect the disease in early

symptoms. The development of image processing techniques like image pre-processing, image segmentation and feature extraction were applied to detect the disease. So k-means clustering for segmentation and SVM for classification makes a major role to detect the disease in maize plant. As a conclusion, the accuracy of 94% obtained from the overall performace.

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