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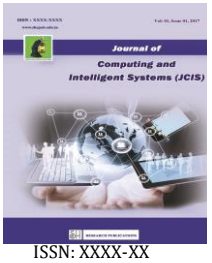

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Automatic Count and Detection of Whitefiles and Leaf Images of Various Plants using FCM Segmentation

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Abstract *—Agriculture is the backbone of the Indian economy. In last ten decades the agricultural crop harvest is reduced by some kind of reasons such as Groundwater exploitation is low, people population, air pollution, climate changes, excess uses of pesticides and pest causes various leaf diseases. The common pest is whiteflies, which affect crops, damage and spread diseases in various plant leaves. It is very arduous to control. This paper presents an approach to automatically detect and count the number of whiteflies from leaf images by using Digital Image Processing techniques. Initially, images are acquired through digital camera and FCM segmentation algorithm is applied to segment whiteflies images from the inputted leaf images. And the percentage of pest infected area is computed. This automatic detection method to detect the whiteflies at an early stage helps in reduced usage of pesticides.*

Keywords: Digital *Image Processing, FCM (Fuzzy c-means).*

1 INTRODUCTION

Agricultural plays vital role in the development of the Indian Economy. Over 58 percent people live in rural area and their depending on agriculture. The Indian agricultural economic level is reduced by these reasons such as very low Groundwater exploitation and crops infected by the pests, bacteria and viruses. Plant leaves are affected by whiteflies. It is spreading virus and bacteria on the whole plant. The way of reduced the pest infection by using pesticides. But the excess use of pesticides very harmful to plant, soil and reduce levels of biodiversity in water. So, early detection of pest and reduce the uses of pesticides. Digital Image Processing plays an important role of detection of the whiteflies in various plant leaves. A lot of techniques are used to detect the presence of pest and infected area accurately in leaves. This paper described automatic detection and count of the whiteflies presence in various plant leaf images. An image is acquired through the camera, those images in digitized form and it's taken as the input image. Then increased contrast level of that image. By increasing the contrast level is to improve the interpretability of the information present in images for human viewers. Then applied a fuzzy c-means segmentation technique is used in the process of partitioning an image into group of pixels. Then measured the infected area and count the number of pest automatically.

2 RELATED WORK

In [2], the authors proposed an image processing techniques applied to identify diseases in various leaf images. Different methods used to detect the leaf diseases. To improve agricultural products is used to measure the leaf, fruits, steam pest and bacterial diseases infection area. Automatic methods are useful to analysis the shape of leaf and find boundaries of infected area. In [3], the authors proposed to review about various segmentation techniques in image processing which are used to detect the plant diseases. There are such as area threshold, otsu threshold, SVM (Support Vector Machine), K- nearest neighbor classifiers, Fuzzy Logic, Artificial Neural Network. The various techniques compared through accuracy and time. In [4] the authors proposed classified the crops through various techniques such as FCM segmentation and texture, color feature extraction. Color and texture features used to extract from the crop images, before applied fcm segmentation technique used to cluster the soil, crop and residue separately. Finally find the error rate through features. It is very fast execution time by using this fcm segmentation. In [5] the authors proposed to calculate the percentage of disease affected pixels of paddy leaf. After k means segmentation, the images are converting to binary image, and then calculated the affected pixels in percentage. Then, calculate the affected pixels accurately from the infected paddy leaf.

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3 METHODOLOGY

The flow of proposed work consists of Image acquisition, Preprocessing and Segmentation as shown in Figure1.

A. Image Acquisition - Leaf images are acquired from CCD camera, with an image file format of .jpeg or .jpg extension. JPEG is a platform-independent format. The .jpg image is taken as input image.

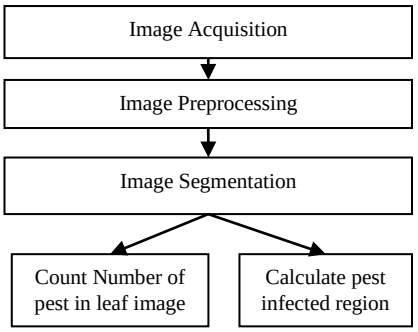


Figure 1 - The flow of proposed Work

B. Image Preprocessing - Contrast adjustment is done by scaling all pixels of the input image by constant value. Altering the contrast of an input image, changes the range of luminance values present in the image. It is used to increase the image contrast.

C. Image Segmentation -Clustering means assigning a task for object set into group means clusters. In general the clustering algorithms are classified into two categories. They are hard clustering and soft (fuzzy) clustering. In hard clustering each data elements belongs to one cluster. In soft clustering each data elements belongs to more than one cluster associate with different degree of membership values. The membership values lie between 0 and 1. The fuzzy c-means clustering was developed by Joe Dunn and after this technique improved by Bezedek in 1981. The steps for fcm algorithm are given below,

a) To Initialize the fuzzy centroids for the clusters, such as c [0] = k1, c [1] =k2,....., c [k] = kn.
b) Measure the distance in between the respective cluster centers.
c) To update the fuzzy membership based on the distance between the cluster center and each point in the image.

$$u_{ij}^{m} = \frac{1}{\sum_{k=1}^{c}\left(\frac{||x_i - c_j||}{||x_i - c_k||}\right)^{\frac{2}{m-1}}} \quad \ldots(1)$$

u_{ij} is the degree of membership of x_i. x_i is the i[th] of d-dimensional measured data and c_i is the d- dimension centre of the cluster. m is denoted any real number greater than 1.

d) To calculate the centroid from the updated image matrix

$$c_j = \frac{\sum_{i=1}^{n} w_{ij}^{m} x_i}{\sum_{j=1}^{n} w_{ij}^{m}} \quad \ldots(2)$$

After the segmentation calculated the number of pest available in the image and infected region.

i. Number of pests in leaf images

The numbers of pests present in the leaf images calculated from the number of pixels in the region and centroid of the vertical and horizontal coordinates.

ii. Calculate the percentage of the pest infected region

The number of pixels and the intensity of segmented image taken from the input leaf image are used to calculate the percentage of infected area.

Percent infection = (Infected area ÷ total area) × 100 ... (3)

4 RESULTS AND DISCUSSION

This proposed automatic detection method is used to detect and count number of whiteflies present in the leaf image. By this early detection of pests agricultural is saved by pest infection and excess use of pesticides. The algorithm was implemented in MATLAB. The proposed algorithm is tested on six different infected leaf images. The results of the proposed algorithm are discussed below. As a first step, an infected leaf image is captured using a digital camera and it is given in figure 2.

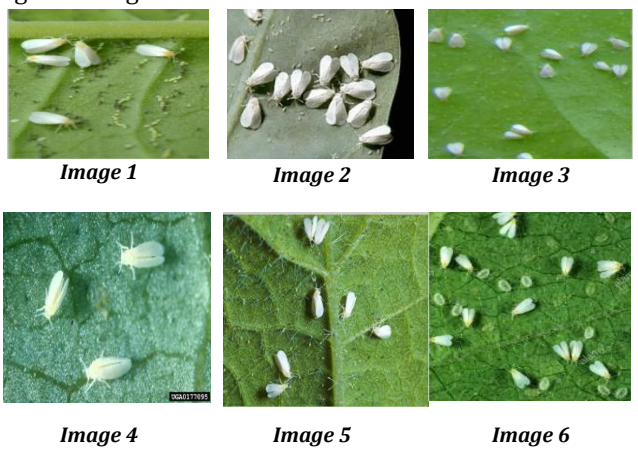
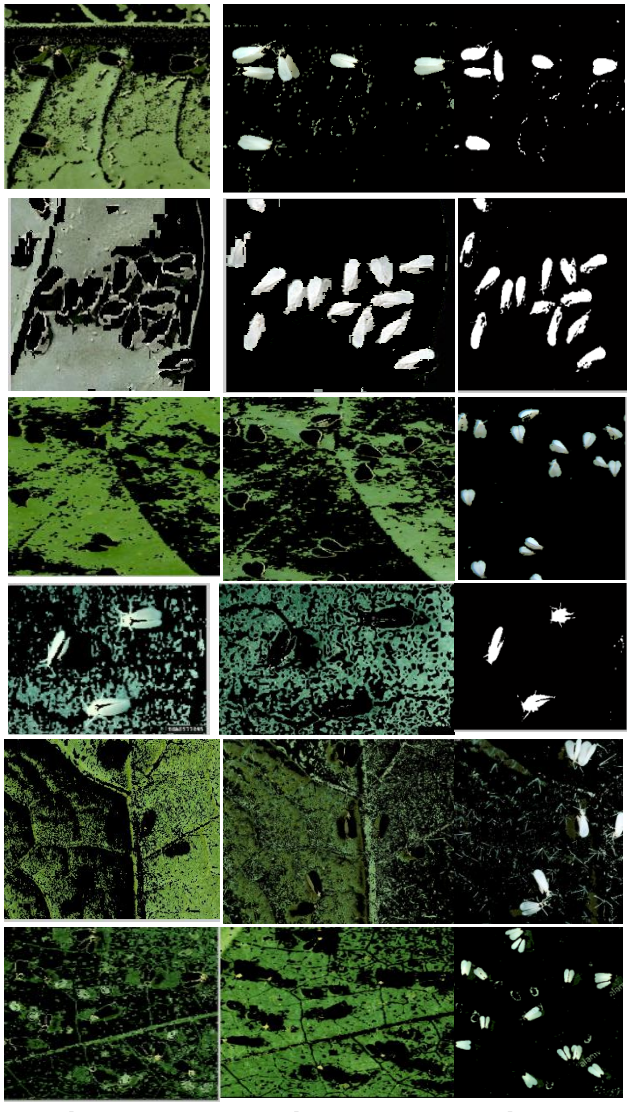


Figure 2 - Input Image

As a preprocessing step the contrast level of the image is adjusted in order to get more accurate result and the preprocessed image is shown in figure 3.

Figure 3- Preprocessed Image

As a next step FCM segmentation is used to cluster the preprocessed image and it clusters the image into three different clusters which are shown in figure 4.



Cluster 1 ***Cluster 2*** ***Cluster 3***

Figure 4- Images segment into three clusters

Then the number of pests in the leaf images is calculated through region properties such as area, perimeter, equivalent diameter and centroid. The experimental result of pest calculation is shown in figure5.

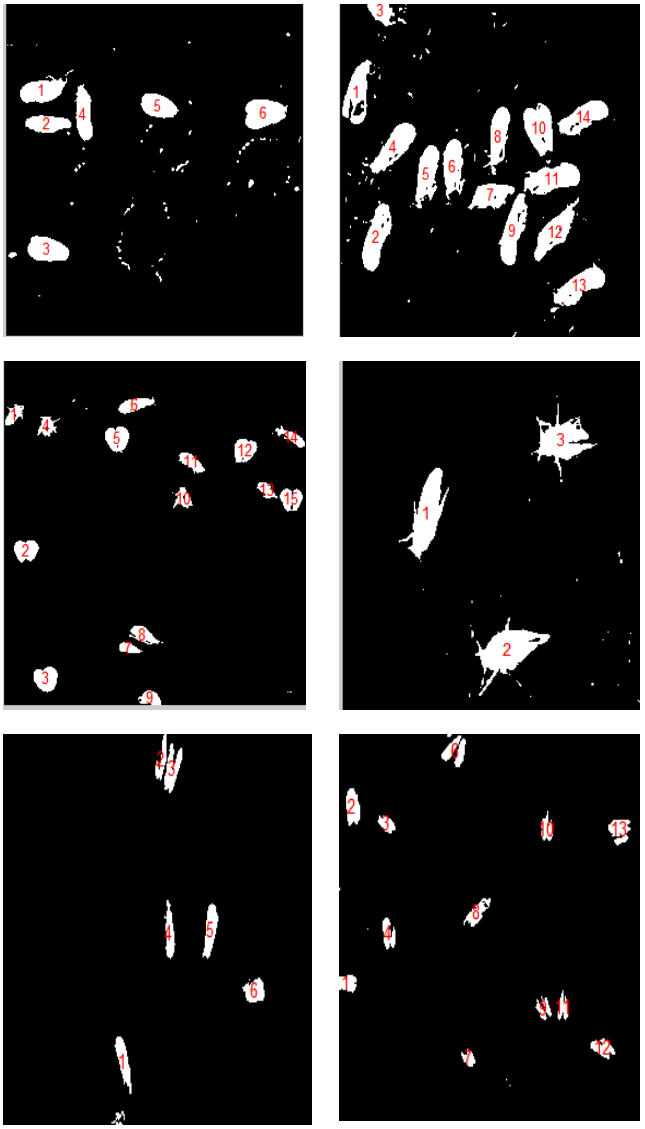


Figure 5 - Calculated number of pest in the leaf Images

After, that accuracy of pest infected region was measured. The results are given in the following table 1.

Table 1 - Both number of pest and pest affected area values for Images

S. No	Whiteflies infected leaf images	Number of Pest	Pest Affected area in Percentage	Elapsed time (seconds)
1	Image 1	6	15.0664	0.437
2	Image 2	14	16.0510	0.360
3	Image 3	15	16.7747	0.374
4	Image 4	3	15.0361	0.282
5	Image 5	6	18.0613	0.374
6	Image 6	13	20.0230	0.608

5 CONCLUSION

Whiteflies, Aphids and thrips are very small in size and these pests are very common to attack crops, plant leaves. But whiteflies only spread the virus and bacteria through entire plant leaves and vegetable crops. So the plants are totally destroyed. It is soft bodied and triangular in shape. Adult whiteflies are tiny and its entire lifecycle is 21-36 days. The major problem of the greenhouse staff is to control the pest infection in plants. By using the proposed method, the pest affected leaves could be detected early and thereby it stops spreading the pest infection.

REFERENCES

[1] Kekane Maruti Arjun, " Indian Agriculture- Status, Importance and Role in Indian Economy", International Journal of Agriculture and Food Science Technology. ISSN 2249-3050, Volume 4, Number 4 (2013), pp. 343-346.

[2] Arti N. Rathod, Bhavesh Tanawal, Vatsal Shah, "Image Processing Techniques for Detection of Leaf Disease" International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 11, November 2013.

[3] Rabia Masood, S.A. Khan, M.N.A. Khan, "Plants Disease Segmentation using Image Processing" I.J. Modern Education and Computer Science, 2016, 1, 24-32.

[4] Anandkumar Patil , Lalitha Y S , "Classification of crops using FCM segmentation and texture, color feature ",International Journal of Advanced Research in Computer and Communication Engineering Vol. 1, Issue 6, August 2012.

[5] Rashedul Islam , Md. Rafiqul Islam, "An Image Processing Technique to Calculate Percentage of Disease Affected Pixels of Paddy Leaf", International Journal of Computer Applications, Volume 123 – No.12, August 2015.

[6] Alan Jose1 , S.Ravi2 , M.Sambath3, "Brain Tumor Segmentation Using K-Means Clustering And Fuzzy C-Means Algorithms And Its Area Calculation" , International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 2, Issue 3, March 2014.

[7] Ganesh Bhadane, Sapana Sharma and Vijay B. Nerkar, "Early Pest Identification in Agricultural Crops using Image Processing Techniques", International Journal of Electrical, Electronics and Computer Engineering 2(2): 77-82(2013).

[8] Hrushikesh Dattatray Marathe , Prerna Namdeorao Kothe, "Leaf Disease Detection Using Image Processing Techniques", International Journal of Engineering Research & Technology (IJERT), Vol. 2 Issue 3, March – 2013.