Pest Detection using Image Processing

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Abstract: ***Agriculture is one of the most significant economic activity. They are many ways that leads to the low productivity of agriculture, but the best method to protect the crop is by detecting the diseases in the early stage. In most of the cases diseases are caused by pest, insects, pathogens which reduce the productivity of the crop at the large scale. If pests are detected on the leaves then, precautions should be taken to avoid huge productivity loss at the end. The main objective of this paper is to identify the pests using image processing techniques like Gaussian blur, segmentation, watershed separation, morphological operations. These techniques are more efficient and less time consuming while identifying the pests over the leaf image with high intensity.***

Keywords: Image processing, Gaussian blur, Segmentation, Morphological operations, Pest identification.

I. INTRODUCTION

Agriculture is main source of food in Asian continent. Agriculture plays crucial role in providing food to every corner. Especially in India 80 percent of food is provided by Agriculture only. Now a day's technology has grown rapidly with growing of population. The population has been increased rapidly when compare to past five years so it has become an major problem to supply the good quality food for all people across our country. So, it is necessary to provide the healthy food in order to do it farmers has to identify the diseases early so that it prevents usage of pesticides and gives good food. For that early detection we utilize use of machine learning techniques. At first, we consider image of leaf and then we apply several image pre-processing techniques on that leaf then we apply machine learning technique named unsupervised learning method named segmentation and then several techniques are applied and at last we calculated the count of pest present on leaf here we consider pests as the features in image processing techniques. Below we had discussed steps in order to calculate count of pests using image processing.

The main objectives of the project is:

- Convert the RBG image into grey scale image
- Transform the processed grey scale image into blurred image
- Applying segmentation technique like watershed separation and morphological operations over grey scale image

Revised Manuscript Received on December 05, 2019.

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Getting the count of pests using morphological operation and watershed separation

II. METHODOLOGY

A. Image Acquisition

The process starts with acquiring the images of leaves. it is the primary step in the workflow sequence as a result of, without an image, no processing is feasible. once acquisition is done, several pre-processing operations are used for removing the noise over the image and considering only attributes which are necessary

B. Color Image To Gray Image

Here in this technique the colored image is converted into grey scale image. Grey scale image is very useful while classifying features for an image. In grey scale image it removes the noise, here noise indicates it removes the color of the image. For an image processing it is better to use of greyscale image processing method and understand how is it useful for multichannel processing rather than processing with full colored image.

C. Gaussian Method

In this method the processed grey image is further transformed into blur image. Blur image allows low frequency to enter and stops high frequency. Here frequency indicates the pixel value, for an image edge pixel value changes rapidly so blur image smoothest the high frequency from the image. For this conversion use GausssianBlur() method which transforms image into blur image.

D. Segmentation

It is the process of partitioning the image into set of pixels or multiple segments. The main use of segmentation is to simplify the image into useful manner. There are different types of segmentations like thresholding, K means clustering, watershed segmentation and morphological segmentation. Here in this paper we discuss the technique of both water shed segmentation and morphological segmentation

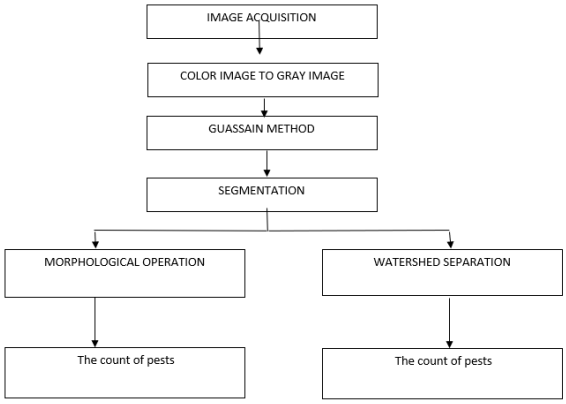
III. MORPHOLOGICAL OPERATIONS

In segmentation technique uses the morphological operations. Morphological operations process the image in such a manner such that the resultant image will have objects which contain the pixel value with one and background contain pixel value with zero. Morphological operations is a collection of non-linear operations based on shape and feature of the image. The main use of morphological operations is to remove the imperfection from the processed image. The operation uses the small matrix structure called structuring element, the size has the more

impact for processing the result. Dilation is generally used for processing of binary image later it is also used over grayscale image. In this paper after gaussian method the processed image is given as input for dilation process. Dilation is nothing but adding the pixel for boundaries of an object in an image. Dilation makes the image more visible and fills the small holes in the object of an image. Erosion operation is applied after dilation. Erosion is one of the operations used in morphological segmentation. In this paper we discuss the binary erosion method. In binary erosion uses the Euclidean grid space. Erosion of a point is defined as minimum number of points in its neighborhood which containing the structured element. In this paper utilize the ndimage. measurements.label() function for counting the number of pests. This function takes any array like object as input and any non-zero values in input are counted as features and zero values are considered as background.

IV. WATERSHED SEPARATION

This method first considers the grayscale image as input and process it into binary image using threshold. Here in this method the black pixels of the image are replaced by grey pixels whose intensity is proportional to white pixels. It uses the Euclidean distance technique for processing the black pixels of an image. The black pixels which are equidistant from each edge are diluted and from their meeting point watershed line is drawn after that setting of minimum and maximum pixel area covering and excluding other objects with minimum pixel value zero and maximum pixel value as 1.Here after setting the values of pixels nucleus counter method is utilized this nucleus counter is useful for getting the count of pests for an given image.

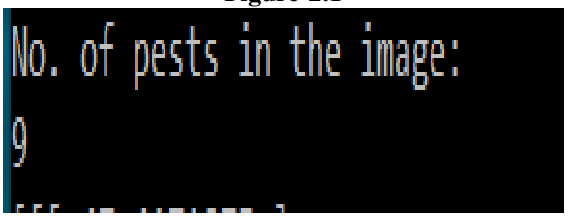


V. RESULT AND DISCUSSION

Figure-1.1

Output-1.2

Figure-2.1



Output-2.2

This Technique helps to find the count of pests on the leaf image by grouping them into one form. Here above methods are applied in an sequential manner to get the output. First reading of the image is done then the colored image is converted into grey image and then grey image into blur image for identifying the attributes over leaf image here attributes indicates the pests. Now the blur image is transformed into average image This average image is given as input to apply the segmentation technique. In segmentation we applied thresholding process for converting the image into binary image .The binary image indicates it contains only 0 and 1's.This binary image is forwarded to input for morphological operations part, in this part it applies dilation and erosion both techniques which intern called closing method and it gives output as binary image which is processed. After that in python we use an inbuilt function called ndimage.measurements.label() which counts all 1's present in binary image and leaves the zeros considering it as non-feature part. We have implemented this on python Open CV. Other way we can use watershed technique which uses nucleus counter process for counting of pests over leaf image. We have examined a leaf and the output obtained from that leaf present in figure-1 is 14. That indicates that there are pests that cannot be visible to our naked eye. So now farmers get alerted that there are pests in their field and take the necessary precautions. Similarly, the output obtained from another leaf present in figure-2 is 9. As this is a healthy leaf there is no need for any precaution. This experiment has been implemented on hundreds of leaves to acquire the mean and standard deviation of these leaves. This process is implemented with different

types of pests in leaves. For calculating accuracy, the system checks count on healthy leaf and diseased leaf. The healthy leaf will contain less count of pests compared with diseased leaf. Since this technique does not provide good accuracy for leaf image with less intensity provided.

VI. CONCLUSION

As farmers are facing losses by several crop diseases and pests. The best way to know about the health of the crop is timely examination of the crop. If pests are detected on the leaf's then, appropriate measures can be taken to protect the crop from a big production loss at the end. Reducing the use of pesticides if disease is detected early and also helpful in using of particular pesticides. The objective of this paper is to increase the productivity of the crop by early detection of diseases and pests. This technique may not provide the best accuracy, but it provides robustness for calculating count of pests since it does not require any training data in order to find the count of pests.

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Shilpa itnal currently working in KLEF as an Assistant Professor. Having 7 years Industrial and 7+ in teaching experience. Area of interest in research are Data Mining, Machine Learning, Artificial Intelligence etc. Interested in subjects like compiler, theory of computation, graph theory, data mining and data warehousing etc.

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