Plant Disease Detection Using CBIR

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ABSTRACT

This paper represents a discussion about one of the usage of CBIR (content-based image retrieval) in our daily life. The agriculture field had developed tremendously in applying technology throughout the years. Farmers are now able to cope up the problems to produce the maximum production. In order to maximize the process, there are specific technologies that can help the farmers to recognize and prevent the plant diseases at early stage. If the process of recognition is done manually, it consumes a lot of human energy by examining each of the plant in a whole thousand hectares. So, researchers around the globe try to invent a system based on color, edges and histogram matching to identify the plant diseases. Furthermore, the data of trait is collected every time a new plant disease is detected. CBIR still lacks maturity, and is not yet being used on a significant scale. In the absence of hard evidence on the effectiveness of CBIR techniques in practice, opinion is still sharply divided about their usefulness in handling real-life queries in large and diverse image collections.

Keyword: Content-Based Image Retrieval (CBIR) Systems, Color Histogram, Image Processing, Image Retrieval, Plant Disease Detection.

1. Introduction

Agriculture has been a highlighted sector in the world for producing the people needs. It is being a dilemma for the sector to contend plant diseases and maintain the quantity of agriculture products. The researchers need to step up this challenge and find the solution to support the farmers. In Prewitt's edge detecting technique, the research is based on color, edge detection and matching histogram technique provide two significant characteristic that is accuracy of detection and speed to recognize the image disease. The research contains two phases. The first phase is the process of getting the data of healthy and infected leaves into the MATLAB. Each phase is called training process. In the training process, the RGB color components are separated into layers of Red, Green and Blue i.e. grayscale image and the apply the Prewitt's edge detecting technique. The histogram for the edge detection technique for each component of healthy and disease leaf image are then stored in the system. For the second training process, it is the testing process to differentiate between the healthy. It will follow through the same process as phase-1. The selected image will be separated into Red, Blue and Green layers. Then, the histograms of the image being generated. Those histograms are then compared with the histograms of the healthy leaf. The different will be updated in the data for following test.

2. Research Method

The Prewitt's edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. The image processing enables application to detect edges of diseased leaf and stem, to find shape of infected are, to determine color of infected area, to separate the layers of image and for image segmentation.

Two samples were taken as the subject for experiment. One of the sample is a healthy leaf and an another one is infected leaf.

PHASE-I

Step1. The first step in phase-1 for disease image detection is the RGB images for healthy will go through a training process. The healthy leaf is surely free from any kind of disease so it will not disturb the whole research. Figure 1 and 2 shows the healthy and unhealthy leaf.

Figure 1. Healthy leaf

Figure 2. Infected leaf

Step2. The training process begin. In the process, the images are first separated into the layers of RGB image into Red, Green and Blue layers and then apply the Prewitt's edge detection technique to detect the edges of layered images. The process is applied on both healthy and affected leaves. The layers separation and the edge detection technique if RGB image are shown as below:

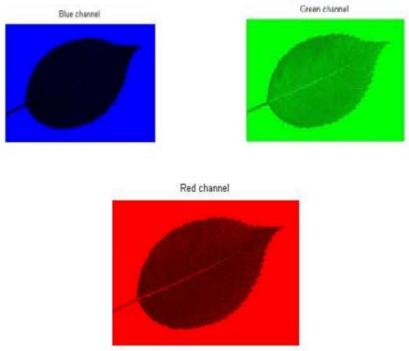


Figure 3. the three layers of image are separated in order to applied Prewitt's edge detection.

The Prewitt's edge detection cannot directly apply to the RGB image. The layer separation plays the important role in detection of disease based on color histogram. The Prewitt's edge detection technique to each layer. The thresholding is fixed to 20 for all Prewitt test.

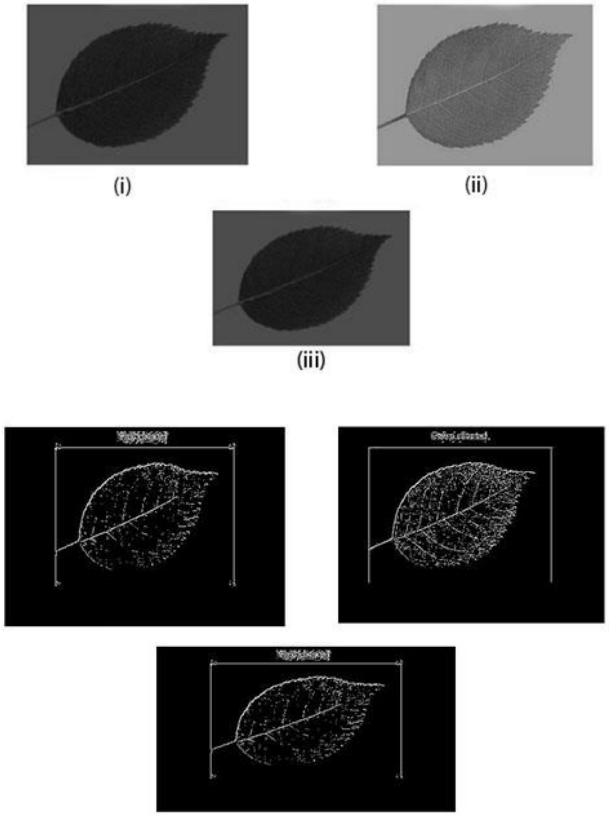


Figure 4, Prewitt's edge detection effect on (i)blue, (ii)green and (iii)red layers

Both healthy and diseased leaves need to go through the same process.

PHASE-II

Step3. In second phase, another leaf is picked up for testing process. Same as phase 1, both must be healthy and the affected leaf. The training process started again on testing image.

Step4. In the training process, the image is separated into layers and again apply Prewitt's edge detection on each layer.

Step5. Once the process of first phase finished, the histogram is generated for both healthy and unhealthy leaf and being stored in the database. The second phase testing process also generated histogram after applied the edge detection technique. Once the sample testing is done, the histogram gathered will immediately compared with the histogram from the database stored.

3. Result And Discussion

The experiment started with two samples, healthy and affected leaf sample. The result of phase-1 become the input The observation shown the healthy sample in red, green and blue layers. The layers separation is important for edge detection. We cannot apply edge detection directly on the RGB healthy leaf sample. Following the result for diseased sample:

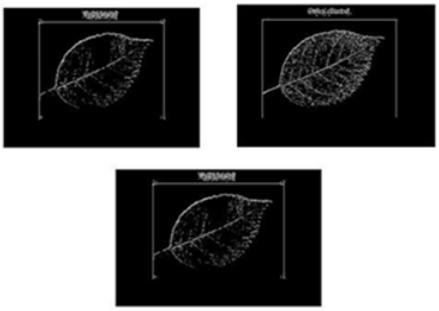


Figure 6. Result of diseased sample

The above figure shows the different layers of the sample and the edge detection applied. The histograms are generated for healthy leaf sample, diseased leaf sample and testing leaf sample. The comparison technique based on the histogram. The MATLAB process is started on both. The healty is shown below:

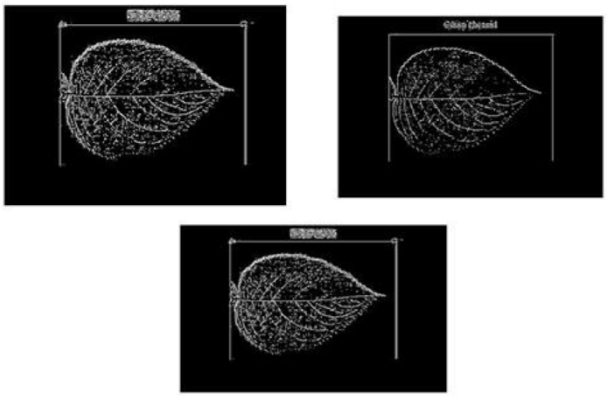
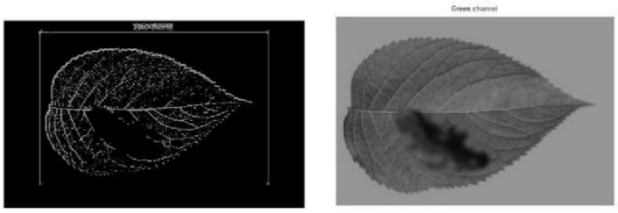
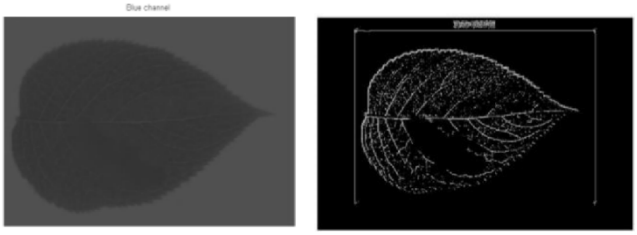


Figure 5. Healthy sample result

and edge detection tecnique. The comparison is shown below:

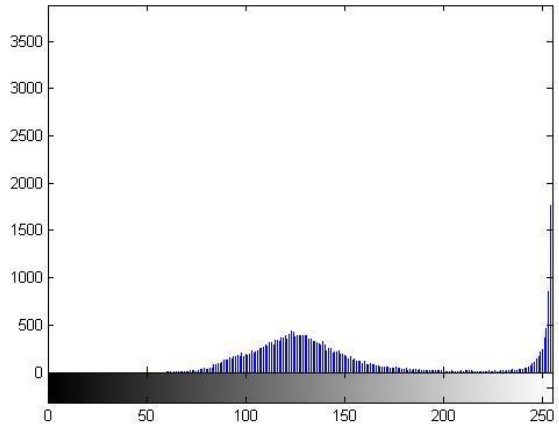


(ii) red



(iii) blue

Figure 7. Experimen result of testing sample



Diseased sample test

Figure 8, the comparison between the samples

Based on the graph collected, result can be calculated by histogram comparison in MATLAB.

```
>> Histogram
   2.0649e-04
```

Figure 9, result for healthy and diseased leaf

The result portrays the difference between two leaves. The difference shows that the leaves have a slightly different characteristic.

4. Discussion And Conclusion

The process of retrieving the images by using histogram matching gives a very effectives results. The comparison is based on color, edge and texture. The color features extraction is applied on samples that are contained the healthy leaf of plant and the diseased leaf of the plant. The training process includes the training of these samples by using layers separation technique which separate the layers of RGB image into red, green, and blue layers and edge detection technique which detecting edges of the layered images. Once the histograms generated from both samples and the testing samples, immediately applied comparison.

The future work mainly concerns with the large database and advance feature of color extraction that contains a better result of detection. Another work concerns with research work in a particular field with advance features and technology.

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