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Plant Disease Diagnosis Using Distance Based Partition Clustering

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Abstract— Plant disease analysis is one of the critical tasks in the field of agriculture. In this paper we define a layered model to identify the plant disease based on leaf images. To perform the disease identification and categorization there is requirement of some clustering and classification algorithm. In this work a layered approach is suggested to perform the identification of disease in plant and to classify the collection of plant images based on the disease. The clustering is performed at the initial based on intensity variation analysis. Once the clusters are identified, the refinement over these clusters is performed using mathematical operators. image segmentation is performed to identify the diseased regions. Then, features are extracted from segmented regions using standard feature extraction techniques. These features are then used for classification into disease type. The clustering is performed at the initial based on intensity variation analysis. Once the clusters are identified, the refinement over these clusters is performed using mathematical operators.

Keywords: Leaf Diseases Analysis, , Clustering,Segmentation.

I. INTRODUCTION

Growing world population has brought a lot of pressure on agricultural resources. It is imperative to obtain maximum yield from crop in order to sustain the population and the economy. Plant diseases are the main source of plant damage which cause economic and production losses in agricultural areas. Owing to distressed climatic and environmental conditions, occurrence of plant diseases is on the rise. Bhutan experienced for the first time one of the worst rice blast epidemic in 1995 during which most of the rice growers in Paro and Thimphu suffered heavy losses. Similarly the late blight disease of potato which is caused by a fungus (Phytophthora infestans) is quite endemic and appears again and again when the monsoon is heavy. Once the disease spread it will inflict heavy loss to potato growers. Plant scab is another disease in plants grown in the high altitudes of Thimphu, Paro, Haa and Bumthang. For this, most of the orchard owners in the above regions carry out regular spraying with fungicides. Chilli wilt disease has become another headache for the agriculture extension. We have not yet found out any reliable solution. While the incidence of diseases on minor crops may not be of much concern, when diseases bring about a heavy loss on important cash crops like potato and plant and staple crops like rice, it is a cause for much concern. One cannot afford to neglect the plant disease aspects. Image processing is one of the most growing research area that is having its participation in different application areas including the biometric system, biomedical system etc. One of such application area is the agricultural industry. In this application area, image processing is been utilizing in different ways to identify the crop, plant, leaves, flower, fruits etc. as well as to identify the disease. The presented work is focused on the disease identification and classification for plant disease. Plant disease identification is basically focused on the disease analysis based on plant leaf image. To perform the disease identification and categorization there is requirement of some clustering and classification algorithm. In this work a layered approach is suggested to perform the identification of disease in plant and to classify the collection of plant images based on the disease. To perform the disease identification in leaf image, at the earlier stage, the image segmentation will be applied to identify the image ROI. It will reduce the processing dataset. A color model based analysis will be performed to identify the image ROI. At the later stage, the multi parametric clustering will be implemented to segment different image out of these areas the effective identification of disease area will be performed. At the final stage, moment based analysis will be applied to identify the disease plant over the plant set. The presented work is about to reduce the false recognition rate and to provide the accurate disease identification over the leaf images. The work will be implemented in matlab environment.

II. RELATED WORK

Different segmentation and classification techniques have been proposed by different researchers. Some of these are listed below:

Al-Hiary et al [5] has proposed a research work in which he present algorithm for fast and accurate detection and classification of plant diseases. The algorithm starts by acquiring RGB images. In the next step color transformation is applied on RGB images. Images are then segmented using K-means clustering techniques. Texture features are extracted from segmented area using Gray Level Cooccurrence Matrix (GLCM). Neural Network is used as a classification tool. The overall accuracy of this technique is 94%.
Camargo et al [1] proposed an algorithm to identify plant diseases using image processing. First the color transformation of the acquired image is done. These transformed images are then enhanced using Gaussian filter. On this transformed image segmentation is performed in order to segment the disease regions

Zhao et al [4] proposed a method for recognition of image leaf diseases using machine vision. Image segmentation is based on threshold. Freeman link code is used for feature calculation and diseases are deduced according to binary tree search method. The accuracy of five maize leaf diseases is above 80 %.

separately by locating optimum threshold. Then the segmented regions are labelled as diseased. In Year 2006, QingXiang Wu performed a work," Knowledge Representation and Learning Mechanism Based on Networks of Spiking Neurons". Knowledge representation is very important in intelligent systems - e.g. for knowledge discovery, data mining, and machine learning. The human brain, a significant intelligent system, works with a huge number of spiking neurons. Based on spiking neuron models a new generation of spiking neural networks (SNNs) has been developed for artificial intelligence systems. SNNs are computationally more powerful than conventional artificial neural networks. In this paper, the spiking neuron model is applied to represent logic rules and fuzzy rules. Based on the STDP (Spike Timing Dependent Plasticity) principle, a new SNN model is proposed for pattern recognition In Year 2011, Jae-sun Seo performed a work," A 45nm CMOS Neuromorphic Chip with a Scalable Architecture for Learning in Networks of Spiking Neurons". Efforts to achieve the long-standing dream of realizing scalable learning algorithms for networks of spiking neurons in silicon have been hampered by (a) the limited scalability of analog neuron circuits; (b) the enormous area overhead of learning circuits, which grows with the number of synapses; and (c) the need to implement all inter-neuron communication via off-chip address-events. In this work, a new architecture is proposed to overcome these challenges by combining innovations in computation, memory, and communication, respectively, to leverage (a) robust digital neuron circuits; (b) novel transposable SRAM arrays that share learning circuits, which grow only with the number of neurons; and (c) crossbar fan-out for efficient on-chip inter- neuron communication. In Year 2011, Sawsan M. Mahmoud performed a work," Abnormal Behaviours Identification for An Elder's Life Activities using Dissimilarity Measurements". The aim of this paper is to design a system able to detect the abnormal behaviours of daily activity living in an intelligent environment. Author approach this by applying dissimilarity (distance) measures on data collected from a single inhabitant environment. In this paper, two major dissimilarity measures, which include hamming distance and fuzzy hamming distance, are used and compared. These measures can help in distinguishing between normal and abnormal behaviour patterns in order to improve the quality of elderly people's lives.In Year 2012, Yingying Zhu performed a work, "The Role of Spatial Context in Activity Recognition". In this paper, Author propose a mathematical framework to model activities with both motion and context information for activity recognition. This is motivated from the observations that an activity does not only depend on the motion of the objects of interest but the surrounding objects also provide useful cues for an understanding of the activity. Presented model aims to automatically capture and weigh motion and context patterns for each activity class, from sets of predefined attributes, during the learning process. Author show how to learn the model parameters via an unconstrained convex optimization methodology and how to predict the correct label for a testing instance. Wu Chun performed a work on SAR image processing for noise reduction over the images. Author propose an amalgamation frame based on EMD andPCA algorithm. The frame can effectively filter the speckle noise and enhance the structure character which finally can be seen by people's eyes. Using the proposed method, the speckle noise of SAR image in different scale is filtered. At last, Author obtain the new denoised SAR image

III. PROPOSED METHOD LAYER

- Read the Plant Image as Input
- Convert Image to Grayscale
- Normalize the image
- Adjust the brightness and contrast
- Perform the region Segmentation using improved Clustering Approach
- Apply the mathematical and morphological operator for effective
- Colorize the regions to represent the disease area

Image Acquisition

The data collection is the major aspect of the data collection in area. The same collection has been used in other studies of automatic scan images segmentation. Various image databases' available world-wide along their name, description and applications. The image acquisition is required to collect the actual source image.

Pre-processing:

The principle objective of the image enhancement is to process an image for a specific task so that the processed image is better viewed than the original image. Image enhancement methods basically fall into two domains, spatial and frequency domain. Region of Interest Image Filter: This filter allows the user to choose specific spatial area in an image. In case of image pre-processing, this filter is primarily used to isolate an area (volume in 3D) of an image for processing. MIP offers users to choose different parts of image by selecting different dimensions of image using ROI filter

Image Segmentation **:**

Segmentation is used to separating the diseased region from non-disease region in a leaf image. This is done by thresholding the gray scale leaf image such that all gray values below the threshold _ are represented as white and those above _ are represented as black. For the selection of threshold _ Otsu's algorithm is applied. The result of this segmentation procedure is binary image where in the diseased region is represented with a white and nondiseased region is black. Morphological operators 'open' and 'fill' are used for further removing any misleading tiny dots. Once the binary image has been obtained it is mapped with the original colored image to obtain a masked colored image where the diseased region is represented in color and rest of the image is black.

Image segmentation is the process of partitioning an image into meaningful regions with respect to a particular application. Image Segmentation is the process of partitioning a digital image into segments (set of pixels, also known as super-pixels). Segmentation is to subdivide an image into its component regions or objects. It should stop when the objects of interest in an application have been isolated [1].

Segmentation algorithms generally are based on one of 2 basis properties of intensity values

Discontinuity : To partition an image based on sharp changes in intensity (such as edges).

Similarity : To partition an image into regions that are similar according to a set of predefined In.

Feature Extraction:

A fundamental task in image processing used to match two or more pictures taken, for example, at different times, from different sensors, or from different viewpoints.

Classification :

Classification is Image Classification is a crucial step in all image analysis tasks in which the final information is gained from the combination of various data sources, change detection, and multichannel image restoration .

Evaluation & Interpretation ***:***

One of the most effective image processing activity is to improve the image features or attributes so that various associated will work effectively over the images or video. The associated operations performed over the image can be performed in spatial domain. It means, the pixel level operation in such operations are considered mostly.

These operations can be applied in each image processing operation initially or it can be performed on some image part

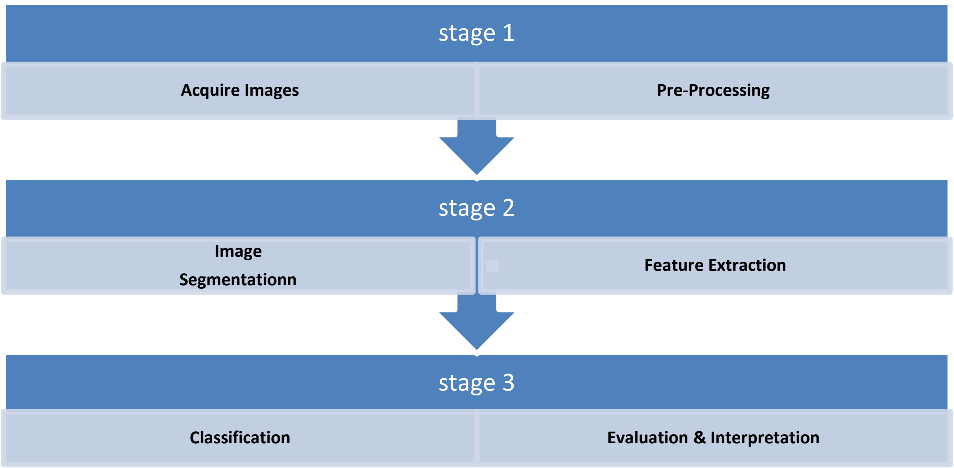

Figure 1 : Stages of image processing

A. Clustering Methods*:*

The K-means algorithm is an iterative technique that is used to partition an image into K clusters. The basic algorithm is:

Pick K cluster centres, either randomly or based on some heuristic.

Assign each pixel in the image to the cluster that minimizes the distance between the pixel and the cluster centre.

Re-compute the cluster centres by averaging all of the pixels in the cluster.

Repeat steps 2 and 3 until convergence is attained (e.g. no pixels change clusters).

In this case, distance is the squared or absolute difference between a pixel and a cluster center. The difference is typically based on pixel color, intensity, texture, and location, or a weighted combination of these factors. K can be selected manually, randomly, or by a heuristic. This algorithm is guaranteed to converge, but it may not return the optimal solution. The quality of the solution depends on the initial set of clusters and the value of K.

B. Histogram-based Methods

Histogram based methods are very efficient when compared to other image segmentation methods because they typically require only one pass through the pixels. In this technique, a histogram is computed from all of the pixels in the image, and the peaks and valleys in the histogram are used to locate the clusters in the image. color or intensity can be used as the measure.

A refinement of this technique is to recursively apply the histogram-seeking method to clusters in the image in order to divide them into smaller clusters. This is repeated with smaller and smaller clusters until no more clusters are formed[2].

One disadvantage of the histogram-seeking method is that it may be difficult to identify significant peaks and valleys in the image.

IV. RESULT

In this paper, an effective clustering improved segmentation approach is defined for plant disease classification and detection. The work has defined an improved clustering approach to perform frequency change analysis and to identify the disease areas over the image. Later on mathematical filters and morphological operators are combined to optimized the results and hybrid model is defined for plant disease identification over the image. combined images using clustering approach, mathematical operators and the curavature analysis. The obtained results shows the effective identification of disease Region of Interest over the image

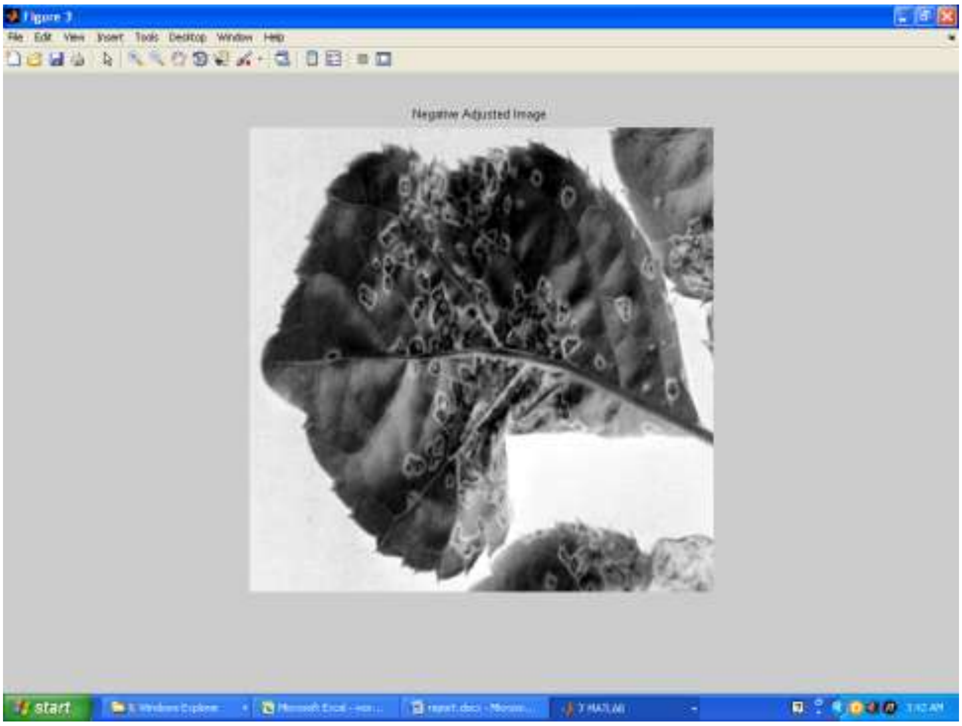

Figure 2.1 : Adjusted Plant Image

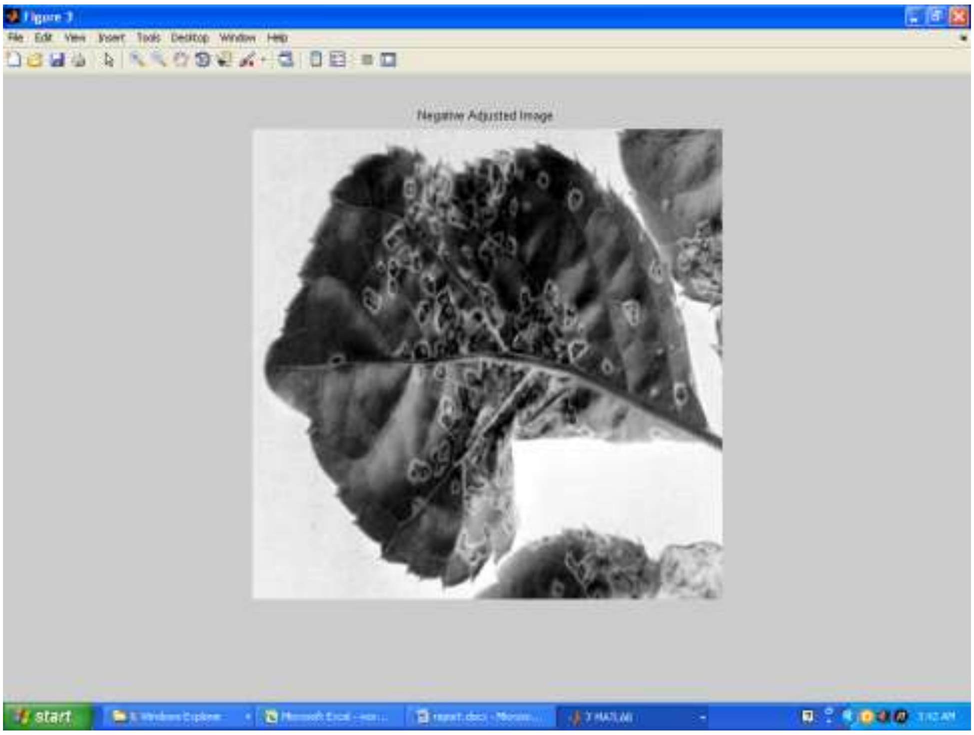

Figure 2.2 : Negative Adjusted Plant Image

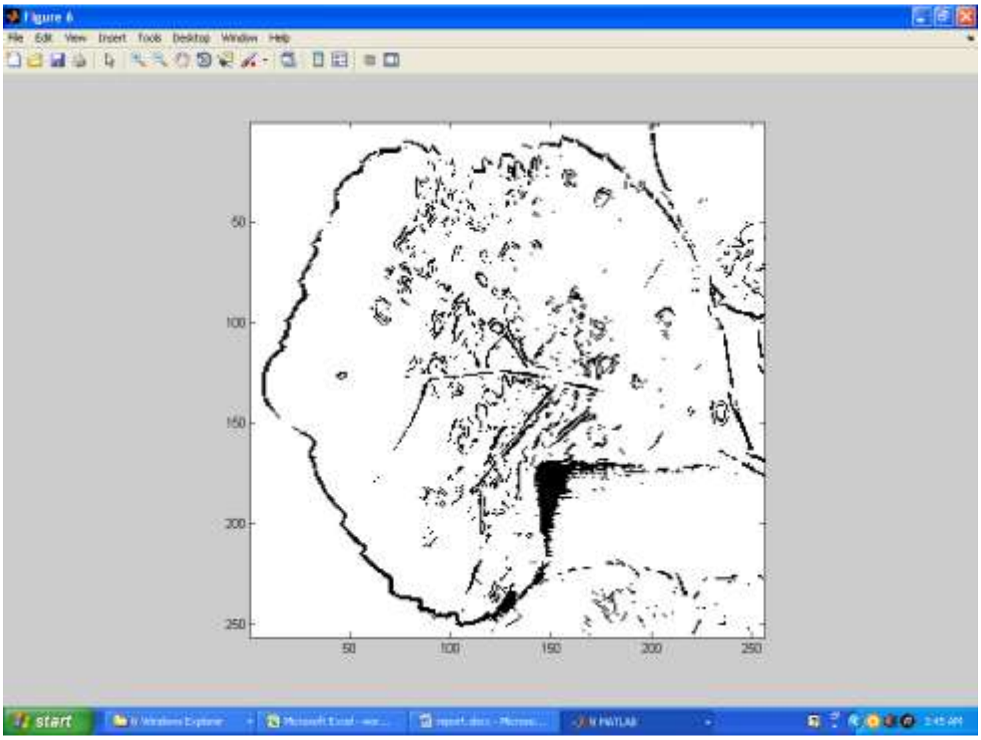

Figure 2.3 : Identification of ROI

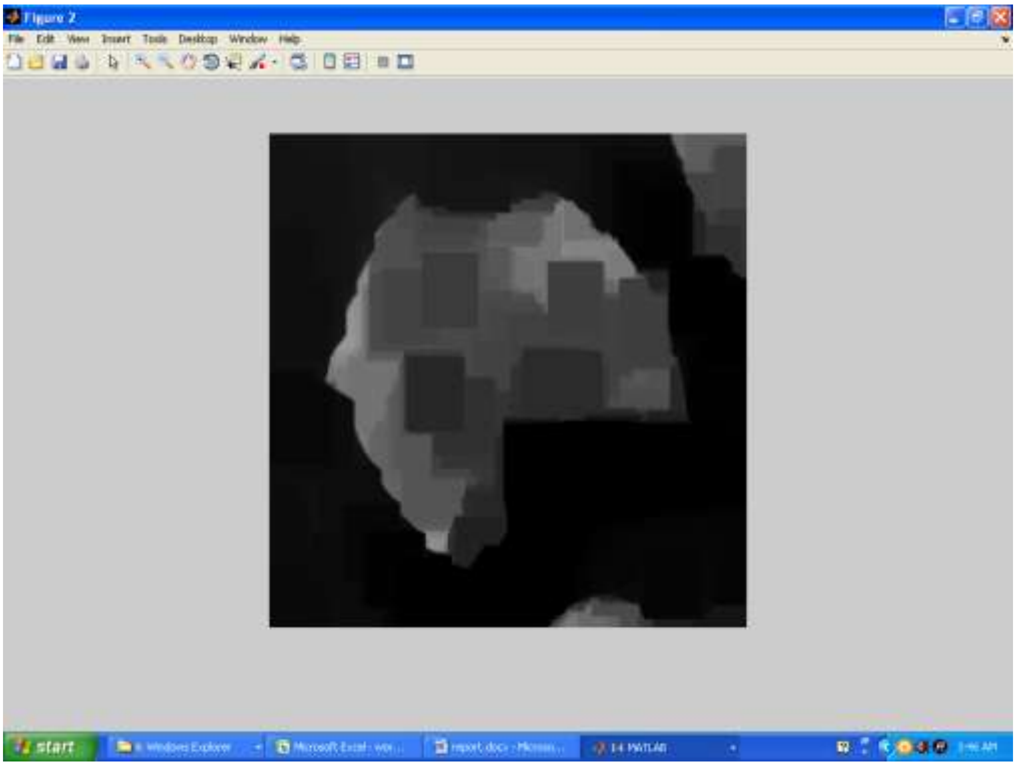

Figure 2.4 : Implementation Results of Morphological Operator

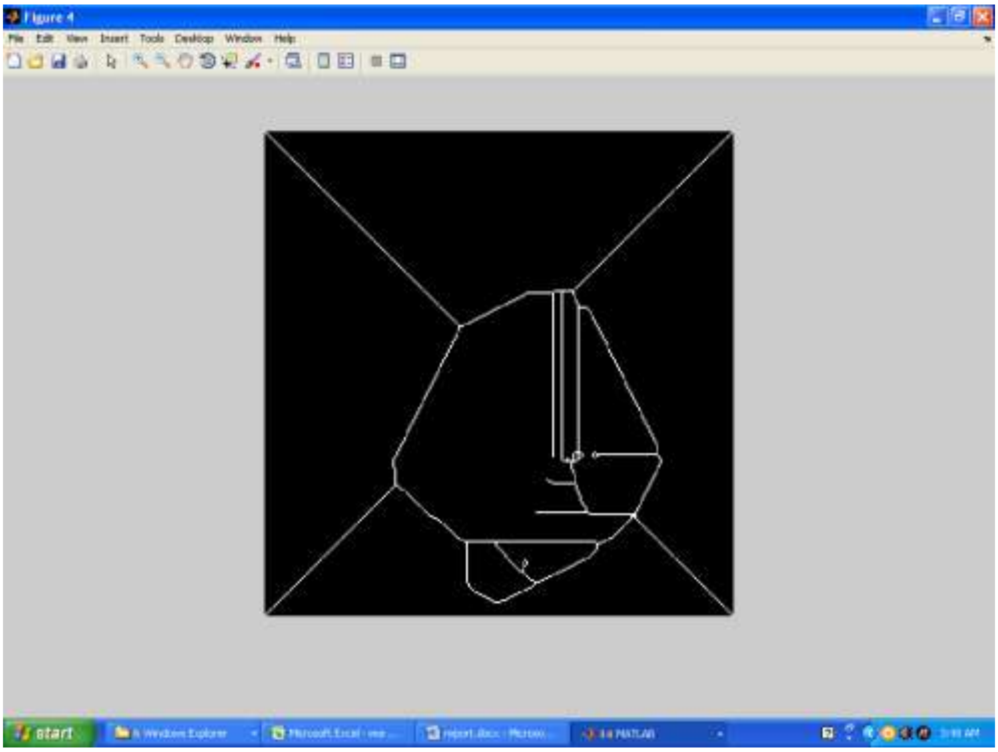

Figure 2.5 : Implementation Results of Watershed Algorithm

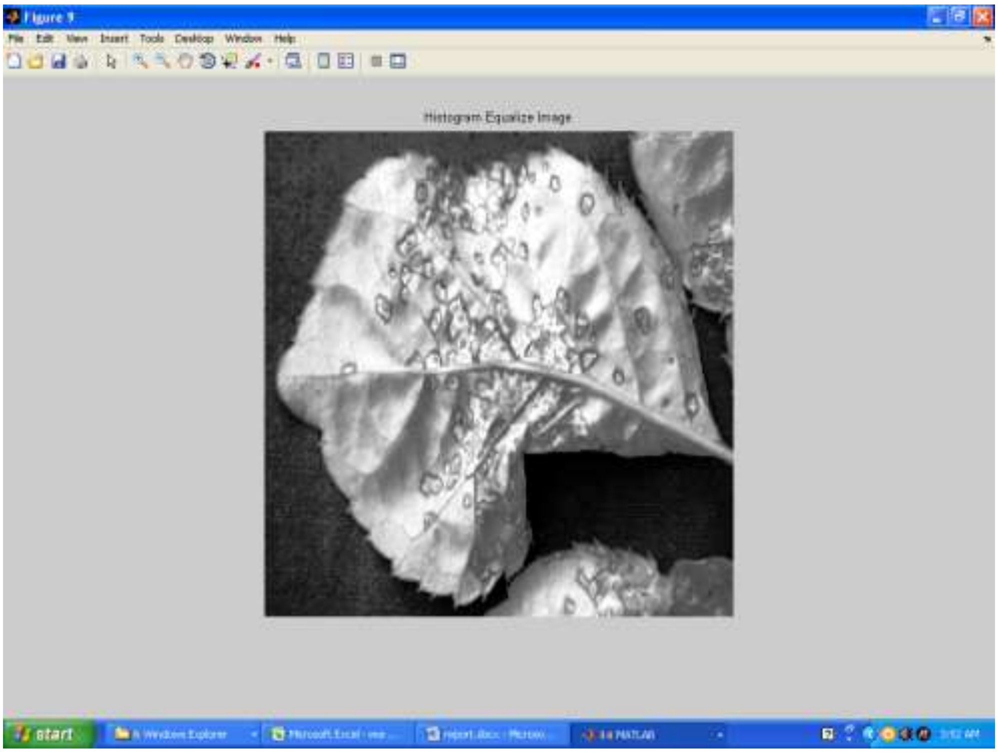

Figure 2.6 : Histogram Equalize Image

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