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Grape Leaf Disease Detection, Classification and Analysis by using Spatial Gray-level Dependence Matrices

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Abstract— *Plant diseases need to be controlled for at least two reasons: to maintain the quality of food produced by farmers around the world and in order to reduce the food-borne illnesses originated from infected plants. Thus, automatic identification of "unhealthy" regions in leaf images is a useful tool for various biological research projects aiming the control of diseases or characterization of plant defense mechanisms. There is a wide variety of plant diseases caused by either environmental factors (nutrition, moisture, temperature, etc.) or by other organisms (fungi, bacteria, viruses). However, in most cases the common symptom is the change of the leaf color. We propose and experimentally evaluate a software solution for automatic detection and classification of Grape plant leaf diseases.*

Keywords— *cluster shade (CS), cluster prominence (CP)*

I. INTRODUCTION

Leaf diseases are economically important as they can cause a loss of yield. Early and reliable detection of leaf diseases has important practical relevance, especially in the context of precision agriculture for localized treatment with fungicides. During the last few years, image classification has proved increasingly useful in biology, as numerous tasks have been simplified with the help of automated image classification. Conventional expert systems especially those used in diagnosing diseases in agricultural domain depend only on textual input. Usually abnormalities for a given crop are manifested as symptoms on various plant parts. To enable an expert system to produce correct results, end users must be capable of mapping what they see in a form of abnormal symptoms to answers to questions asked by that expert system. This mapping may be inconsistent if a full understandings of the abnormalities on any plant. Depending on the user's level of understanding of the abnormal observations, the expert system can reach the correct diagnosis. The abnormal observations in a wrong way and chooses a wrong textual answer to a presented question, and then the expert system will reach a wrong answer. We prepare one method where abnormalities are automatically detected, would reduce the risk of human error and would accordingly lead to a more accurate diagnosis. Image processing will play vital role in a agricultural field. The expert system can reach a correct and accurate diagnosis through extracting symptoms from those defected images and apply the reasoning process while taking into account the extracted symptoms. We classify three different grape diseases like powdery mildew, downy mildew and black rot. The images of these three diseases are as follows

Figure. 1 Black rot

Figure. 2 Powdery mildew

Figure. 3 Downy mildew

II. LITERATURE REVIEW

In [1] the authors have worked on the development of methods for the automatic classification of leaf diseases based on high-resolution multispectral and stereo images. Leaves of sugar beet are used for evaluating their approach. Sugar beet leaves might be infected by several diseases, such as rusts (Uromyces betae), powdery mildew (Erysiphe betae). Camargo and Smith in [2] used SVMs to identify visual symptoms of cotton diseases using SVMs. In [3], a fast and accurate new method is developed based on computer image processing for grading of plant diseases. For that, leaf

region was segmented by using Otsu method [4; 5; 6]. After that the disease spot regions were segmented by using Sobel operator to detect the disease spot edges. Finally, plant diseases are graded by calculating the quotient of disease spot and leaf areas. Kim et.al, have classified the grape fruit peel diseases using colour texture features analysis. The texture features are calculated from the SGDM and the classification is done using squared distance technique. Grape fruit peel might be infected by several diseases like canker, copper burn, greasy spot, melanose and wind scar [9]. Sugar beet leaves are used in this approach. Segmentation is the process that is carried out to extract the diseased region and the plant diseases are graded by calculating the quotient of disease spot and leaf areas. An optimal threshold value for segmentation can be obtained using weighted Parzen-window [10]

III. PROBLEM DEFINITION

Using image processing technique, here we classify three grape leaf diseases which are mostly occurred in Maharashtra state. Here we classify powdery mildew, downy mildew and black rot. Figure 2 shows the basic procedure of the classification method

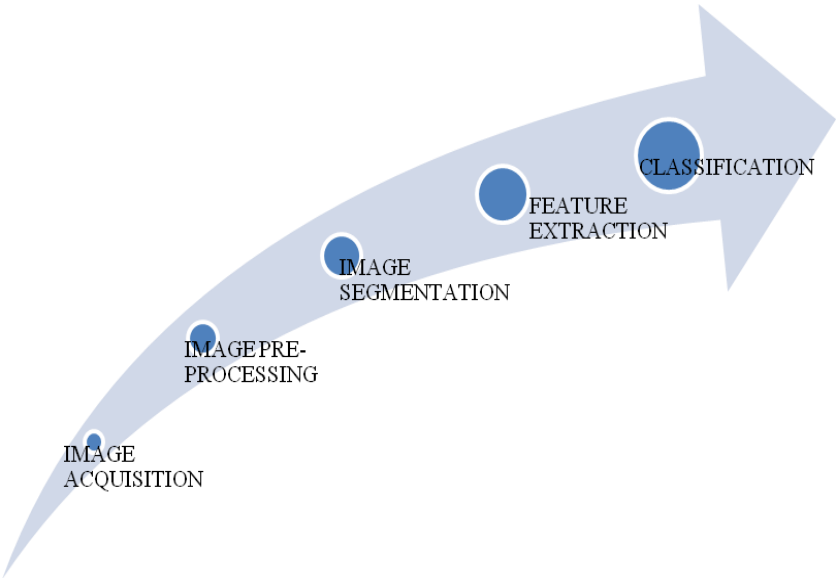

Figure 4 Basic procedure for the grape leaf classification

First, the RGB images of leaves are converted into Hue Saturation Intensity (HSI) color space representation. The purpose of the color space is to facilitate the specification of colors in some standard, generally accepted way. HSI (hue, saturation, intensity) color model is a popular color model because it is based on human perception. After the transformation process, the H component is taken into account for further analysis. After this we mask the green pixel because it does not provide any information regarding identification of disease. So here we remove healthy area of the leaf. This phase is helpful as it gives more accurate disease classification and identification results with satisfied performance and the overall computation time should become significantly less. The infected portion of the leaf is extracted here. After this the infected region is segmented into a number of patches of equal size. The size of the patch is chosen in such a way that the significant information is not lost. In this approach patch size of 32*32 is taken. The next step is to extract the useful segments. Not all segments contain significant amount of information. So the patches which are having more than fifty precent of the information are taken into account for the further analysis. This process gives us useful segment. Then we apply colour co-occurrence method to extract the features. The use of color image features in the visible light spectrum provides additional image characteristic features over the traditional grey-scale representation The color co-occurrence texture analysis method was developed through the use of Spatial Gray-level Dependence Matrices [SGDM] . The gray level co-occurrence methodology is a statistical way to describe shape by statistically sampling the way certain grey-levels occur in relation to other grey-levels. These matrices measure the probability that a pixel at one particular gray level will occur at a distinct distance and orientation from any pixel given that pixel has a second particular gray level. For a position operator p, we can define a matrix Pij that counts the number of times a pixel with grey level i occurs at position p from a pixel with grey-level j. The SGDMs are represented by the function P(i, j, d,) where i represents Θ the grey level of the location (x, y) in the image I(x, y), and j represents the gray level of the pixel at a distance d from location (x, y) at an orientation angle of Θ. Here we calculate feature set for H component only. However, we use GLCM function in Matlab to create grey-level co-occurrence matrix. Here we compute two texture features Cluster shade (CS) and Cluster prominence (CP) for the Hue content of the image as given in Eqns.1-2.

$$CS=\sum_{i,j=0}^{N-1}(i - Dx + j - Dy)^3 M(i, j) \quad \text{---------- (1)}$$

$$CP=\sum_{i,j=0}^{N-1}(i - Dx + j - Dy)^4 M(i, j) \quad \text{---------- (2)}$$

IV. RESULT

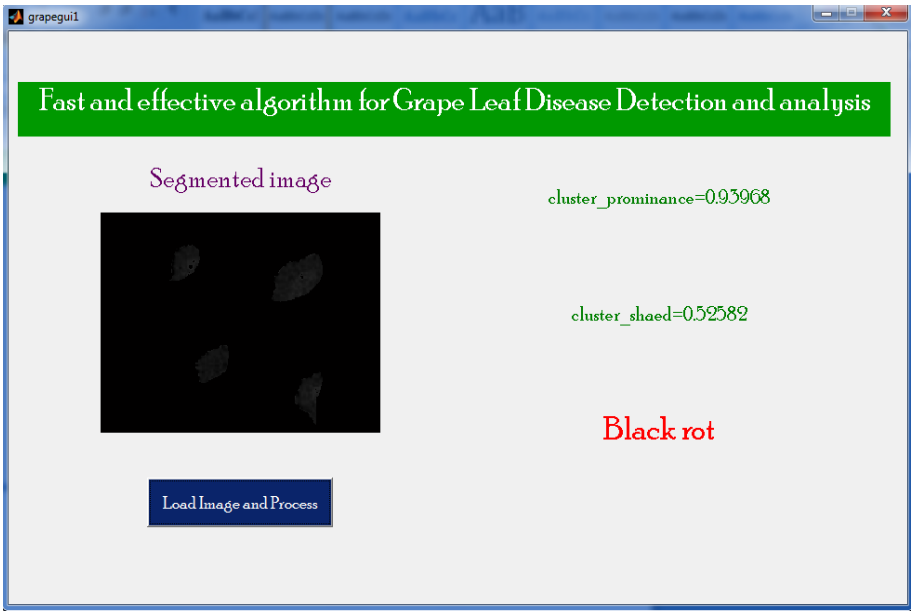

Figure 5. Result window of Black Rot disease

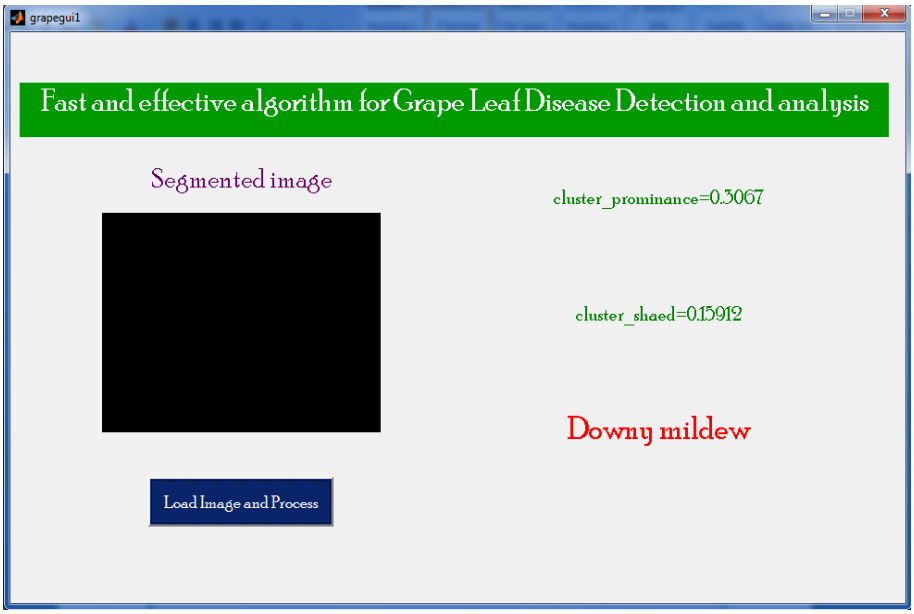

Figure 6. Result window of Downy mildew Disease

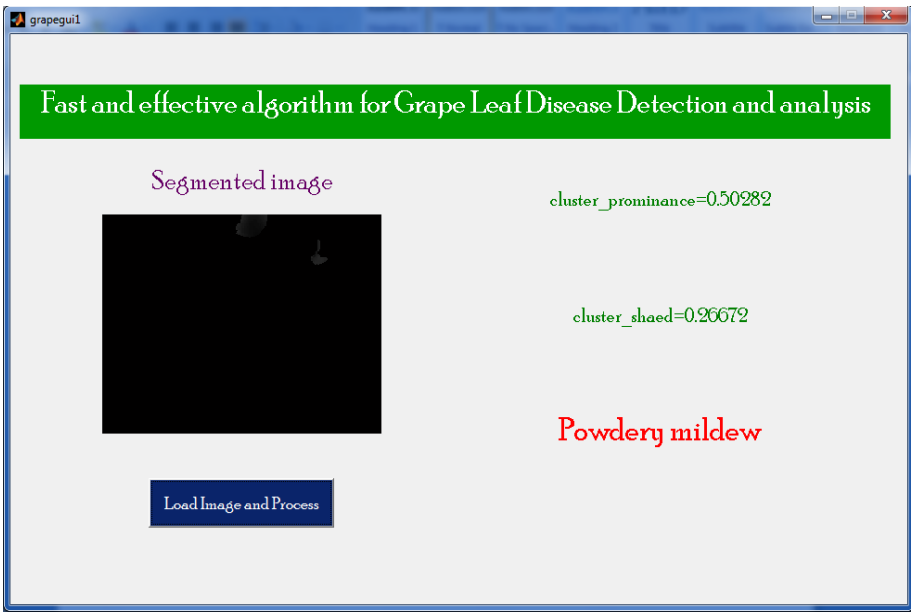

Figure 7. Result window of Powdery mildew Disease

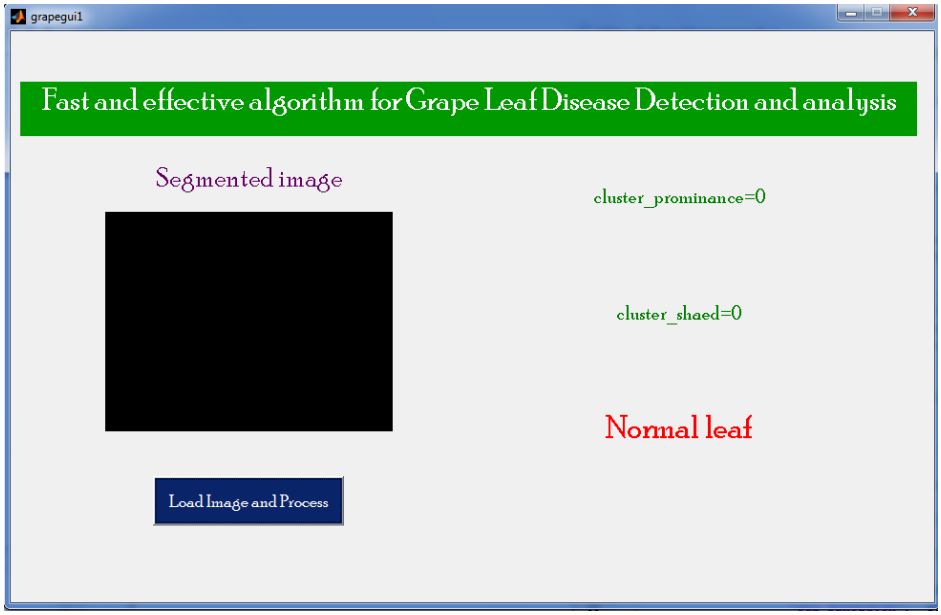

Figure 8. Result window of Normal Leaf

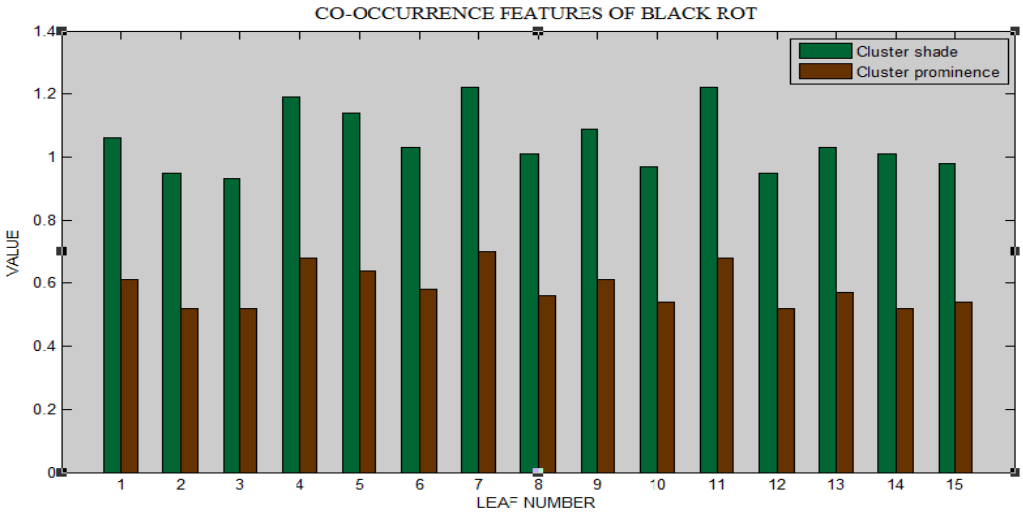

Figure 9. Graphical Representation of Co-occurrence features of Black Rot

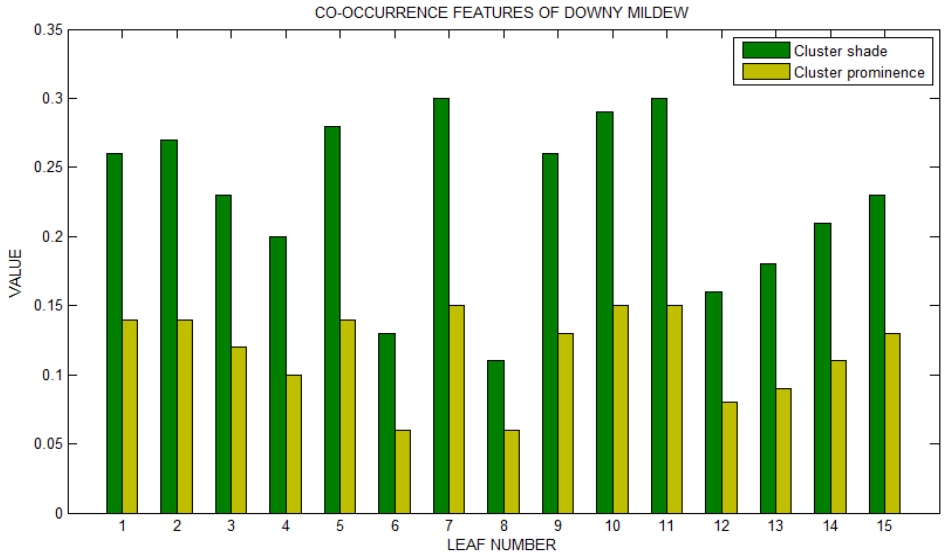

Figure 10. Graphical Representation of Co-occurrence features of Downy Mildew

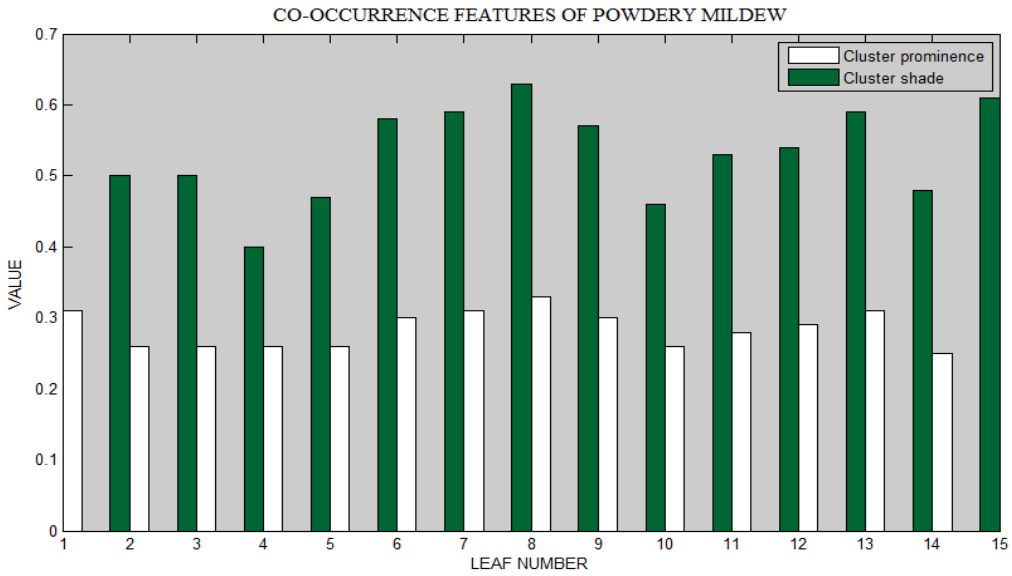

Figure 11. Graphical Representation of Co-occurrence features of Powdery Mildew

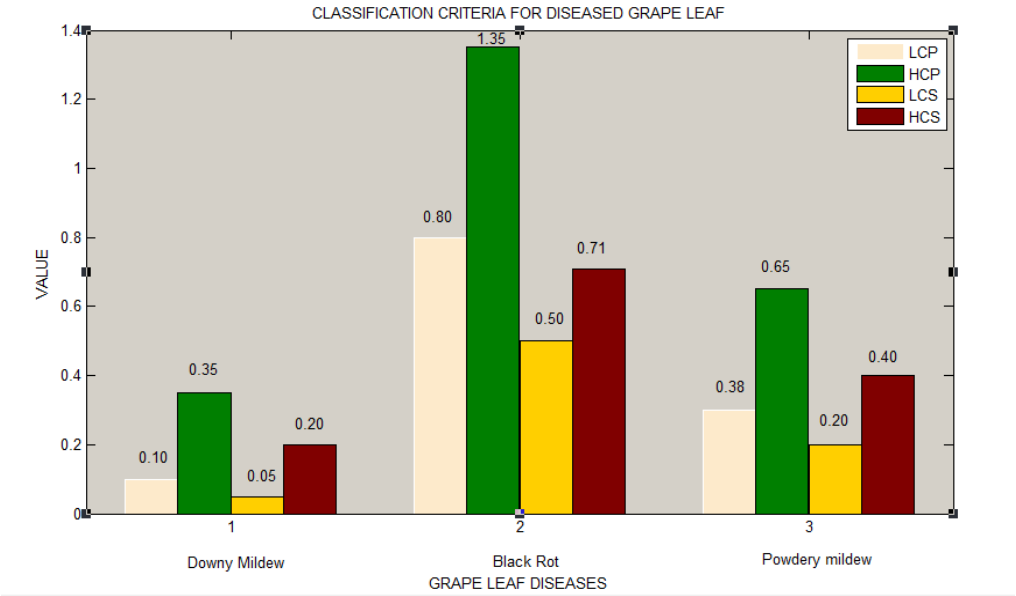

Figure12. Graphical Representation of classification criteria for Diseased Grape leaf

Based upon the Co-occurrence features obtained from different grape plants, it is clear that the leaves which are affected by diseases shows significant differences in their co-occurrence features, so we can easily categorized them.

V. CONCLUSION

This approach provides grate support for agriculture field. It can significantly support an accurate detection of Grape leaf diseases in a little computational effort. Here we can easily classify black rot, downy mildew and powdery mildew diseases of grape leaf. With this method we can produce good quality of grape also we reduce the efforts of farmers. The grape leaf disease detection through leaf image and image processing techniques is very useful and inexpensive system especially for assisting farmers in monitoring the big plantation area.

REFERENCES

[1] Bauer, S. D.; Korc, F., Förstner, W. (2009): Investigation into the classification of diseases of sugar beet leaves using multispectral images. In: E.J. van Henten, D. Goense and C. Lokhorst: Precision agriculture ‟ 09.Wageningen Academic Publishers, p. 229-238.

[2] Camargo, A. and Smith, J. S., (2009). An imageprocessingbased algorithm to automatically identify plant disease visual symptoms, Biosystems Engineering, Volume 102, Issue 1, January 2009, Pages 9-21, ISSN 1537-5110

[3] Weizheng, S., Yachun, W., Zhanliang, C., and Hongda, W. (2008). Grading Method of Leaf Spot Disease Based on Image Processing. In Proceedings of the 2008 international Conference on Computer Science and Software Engineering - Volume 06 (December 12 - 14, 2008). CSSE. IEEE Computer Society, Washington, DC, 491-494.

[4] Sezgin, M. and Sankur, B. (2003). "Survey over image thresholding techniques and quantitative performance evaluation". Journal of Electronic Imaging 13 (1): 146–165. DOI:10.1117/1.1631315 (2002) [5]

[5] Otsu, N. (1979). "A threshold selection method from gray-level histograms". IEEE Trans. Sys., Man., Cyber. 9: 62–66. DOI:10.1109/TSMC.1979.4310076

[6] Otsu, N., "A Threshold Selection Method from Gray- Level Histograms," IEEE Transactions on Systems, Man, and Cybernetics, Vol. 9, No. 1, 1979, pp. 62-66

[7] Mr. Viraj A. Gulhane, Dr. Ajay A. Gurjar, Detection of Diseases on Cotton Leaves and Its Possible Diagnosis International Journal of Image Processing (IJIP),Vol.5 , No.5 , P.590-598, 2011.

[8] Yui-Liang Chen (et.al), Color Image Segmentation Using Wavelet Transform Techniques, 16th IPPR Conference on Computer Vision, Graphics and Image Processing (CVGIP 2003), P.669-675, 2003.

[9] Dae Gwan Kim, Thomas F. Burks, Jianwei Qin, Duke M. Bulanon, Classification of grapefruit peel diseases using color texture feature analysis, International Journal on Agriculture and Biological Engineering, Vol:2, No:3,September 2009

[10] Wang Jun, Wang Shitong, Image Thresholding Using Weighted Parzen Window Estimation. Journal of applied sciences 8(5):772-779, 2008, ISSN 1812-5654, Asian Network for Scientific Information, 2008.

