GUI INTERFACE TO DISCOVER APPLE FRUITS DISEASE HARSHNESS GRADING BY FUZZY

[1]N.PRABHAVATHI,*Asst Professor,Dept of Computer Science*
NGM College,Pollachi,EMAIL ID:praba_rvs@yahoo.co.in
[2]S.MAHALAKSHMI,*M.Phil Scholar,Dept of Computer Science*
Bharathiyar University,NGM College,Pollachi
EMAIL ID:mahalakshimi.jeyakumar@gmail.com

Abstract:

The current research work has proposed a novel approach to design an automated defect identification method which can be applied by farmers to find the defect in fruits at the earliest. There are so many applications that are developed by using image processing techniques to solve the issues in agricultural sector to boost the yield. In the proposed approach the following the steps involved in it. The first step is composed of segmentation algorithm which is developed by involving the K-Means clustering algorithm. The second step involves the state of art techniques to identify the defect in the fruit. Required features are extracted from the image that is segmented from the original image. In the last step the disease that has affected the fruit is classified from the trained image. The classification process is done with the help of Fuzzy Logic.

Introduction:

Scouting is the process of investigating the trees individually by visiting them, were this process is time consuming and labor intensive in nature. A molecular technique can be used in the defect identification using the polymerase chain reaction. However, this process requires lot of samplings and processing. The effect of various diseases finalizes the quality and the quantity of fruits produced from the infected tree. Thus, it also estimates the sustainability of the yield. The diseases which effect the fruit have effects not just on the fruit alone but also in the variety and it it slowly withdrawn from the cultivation. Hence, it is necessary to detect the disease in prior and rectify them as it does not affect the crop health in whole. This can be carried out by following

proper pesticide management such as fungicide applications, applying chemicals based on the disease, pesticide applications and increase in the productivity. The traditional method to detect the disease infection in the fruits is by observing the fruit with the necked eye which is usually done with the help of experts. In country like India (a Developing Country) it very difficult to access the experts in right time to protect the crop from the fore coming disaster as the facility is located in far distance. The fruits that are affected by disease have significant loss in quality and yield during harvest. There is case study which states the fungal disease effect in the soybean plant resulting in severe economic loss to the farmers. The economic loss to the farmers can be minimized to an extent of 20% during harvest by managing the pesticides to plant from the beginning. There are certain other diseases that affect the other parts of the tree developing twigs disease, in leaves and in branches. Hence, it is clear that detection of fruit disease in earlier stage is must to solve the problem of low quality yield, and in spreading of disease in further.

The current research work has proposed a novel approach to design an automated defect identification method which can be applied by farmers to find the defect in fruits at the earliest. There are so many applications that are developed by using image processing techniques to solve the issues in agricultural sector to boost the yield. The application that is proposed in the research involves the hardware like either it can be a camera or a scanner to acquire the image for processing. The research work expose the attempts are extended to include image processing and analysis techniques to a various types of problems in agriculture field.

Research Methodology

The current research has proposed a novel approach which can is very adaptive for the process of detect identification in the fruits using the images with the support of image processing techniques. In the proposed approach the following the steps involved in it. The first step is composed of segmentation algorithm which is developed by involving the K-Means clustering algorithm. The second step involves the state of art techniques to identify the defect in the fruit. Required features are extracted from the image that is segmented from the original image. In the last step the disease that has affected the fruit is classified from the trained image. The classification process is done with the help of Fuzzy Logic.

In the proposed system five types of apple fruit diseases are considered for evaluation of the automated defect identification. The following are the diseases that are considered for examination apple blotch, apple rot and apple scab, Bitter rot, Flyspeck and Scooty blotch.

The proposed system is developed as GUI (Graphical user interface). The figure 4.1 shows the classification system using fuzzy logic. It contains the following steps:

i) Load the defected image from data set.

ii) Binary of Original image

iii) Segmentation and cluster selection

iv) Feature Extraction

v) Classification

vi) Defected region

vii) Grading the fruit

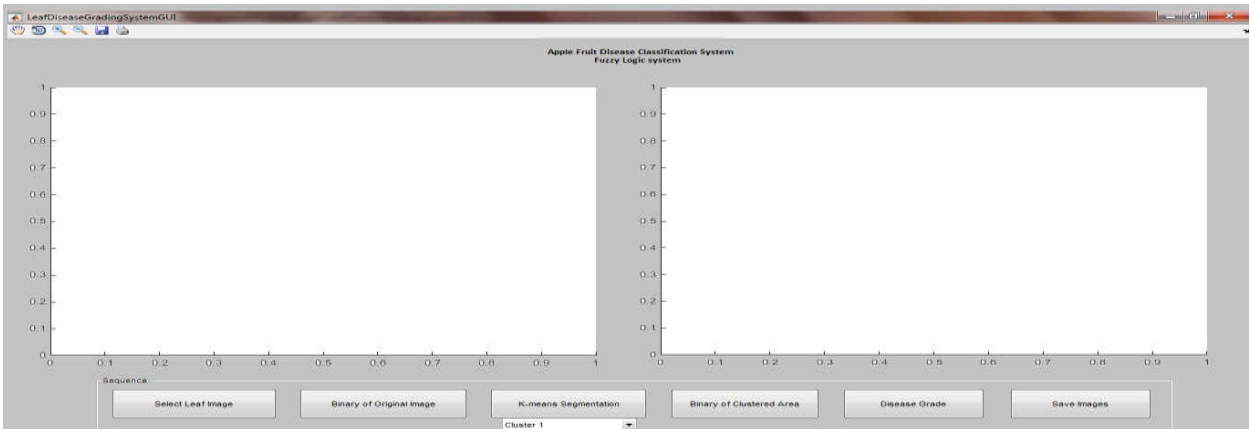


Figure 4.1 GUI to detect the apple fruit disease classification System

Load the defected image from data set.

The device used to capture the image of the defect fruit is of very high resolution with range of 456 x 391 pixels digital camera. The camera is with 6 mega pixels. The digital camera has a focal length range of 5.4 to 16.2mm.

The defects that are found in the database are fungi attack, bruise, and punch.Figure 4.1 and 4.2 shows the process of loading a image from the database.

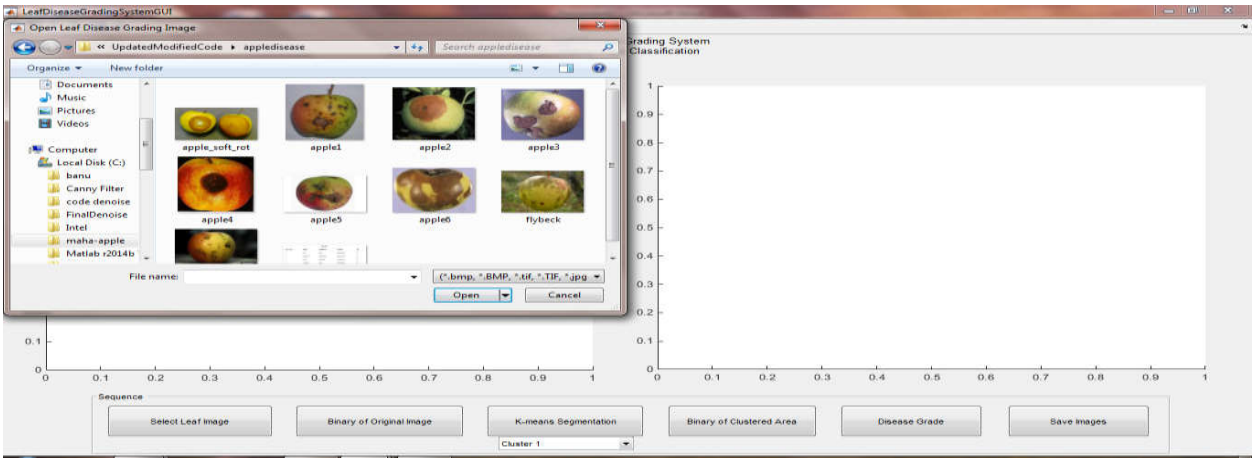


Figure 4.1 Input images from the data set

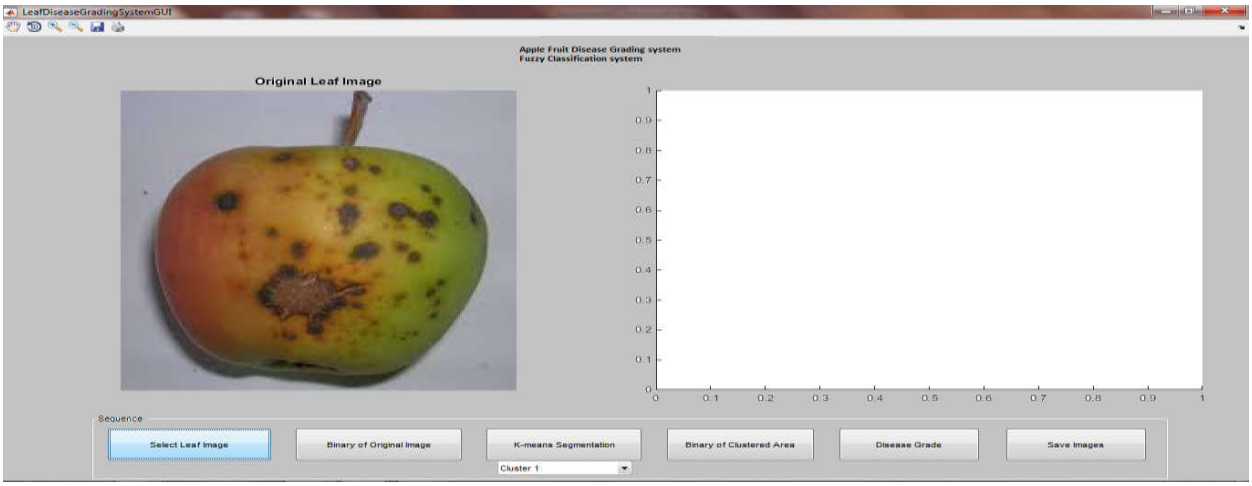


Figure 4.2 selection of input image from the data set

Binary of Original image

The intensity differences are improved by performing a contrast stretch in the dynamic range of the image. The intensity differences in the highlight are improved in tonal enhancements. The

brightness differences are improved in the mid tone (grays), or shadow (dark) regions of the image for further feature selection.

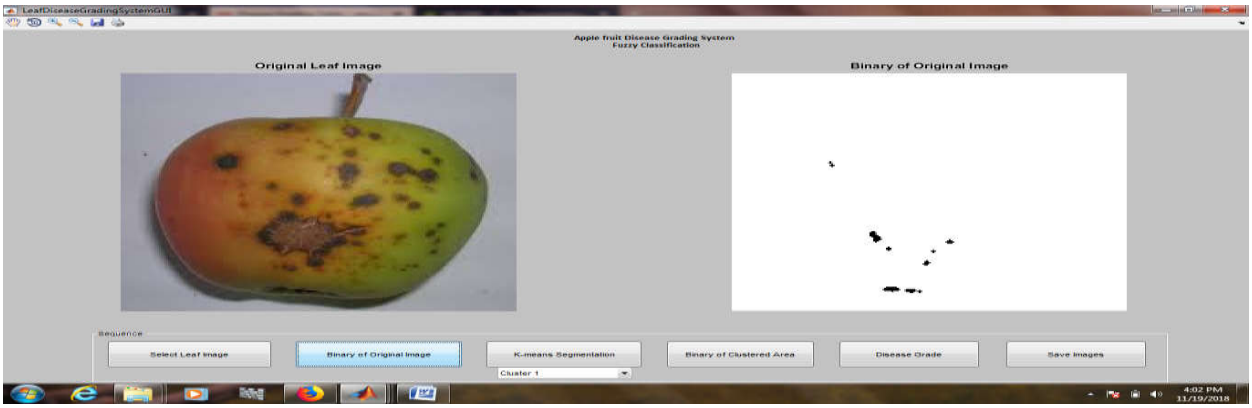


Figure 4.3: Binary of Original image

Segmentation

In the proposed method segmentation is carried out by implementing K-Means clustering algorithm. The image is clustered into n number of observation into k communally identical clusters in K-means clustering technique. Figure 4.4 shows the segmentation of the defective input image.

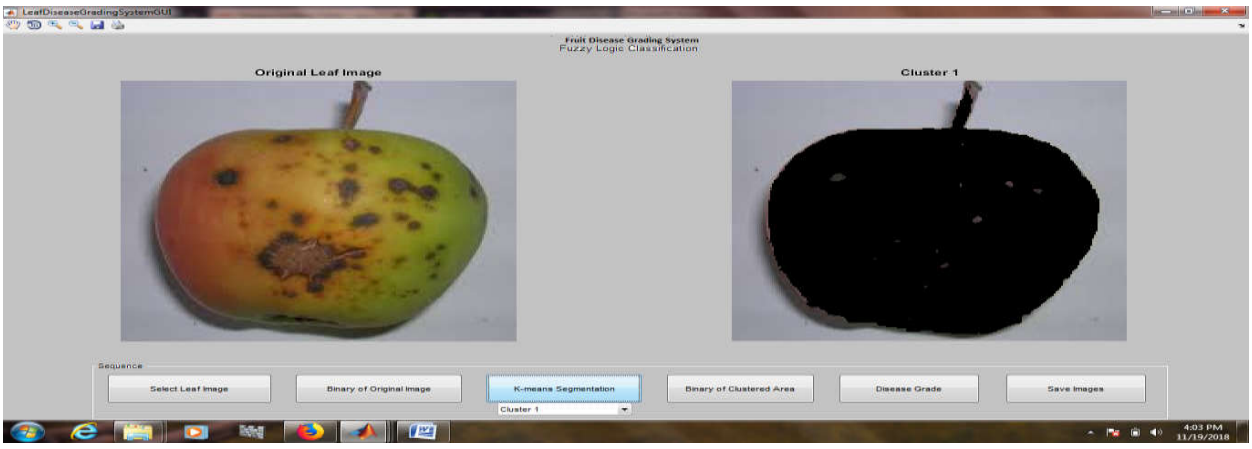


Figure 4.4: Segmentations cluster 1

Once, the segmentation process is complete, the clusters among the segmented data holds the defective spot of the apple fruit image which is extract from the original image. The extracted image is saved for later calculations. In these clusters every observation belongs to the closest mean. Figure 4.5 and 4.6 shows the cluster formation of defective image.

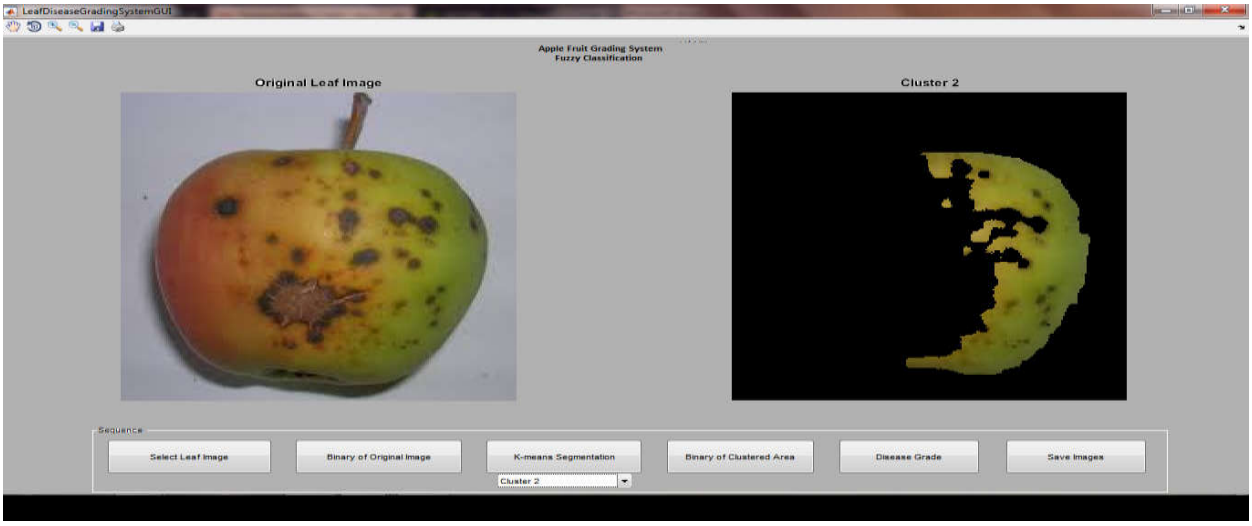


Figure 4.5: Cluster (2) formations in segmented image

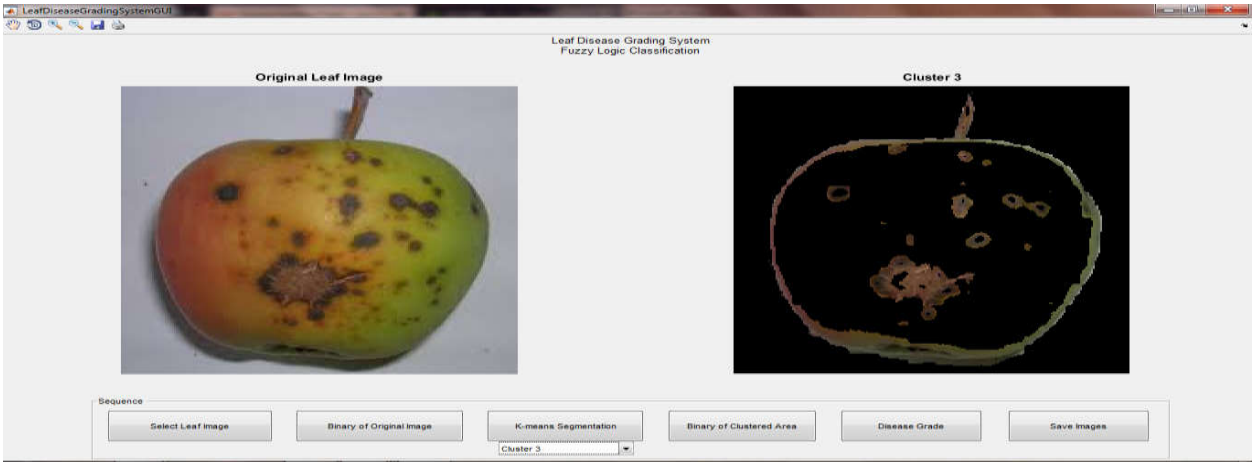


Figure 4.6: Cluster (3) formations in segmented image

The extracted image is saved for later calculations. K-means clustering algorithm is a distinctive technique for segmentation. K-means clustering algorithm is used to find out the usual cluster of

pixels which are found in the image. Figure 4.7 shows the cluster formation with dynamic centroid motions.

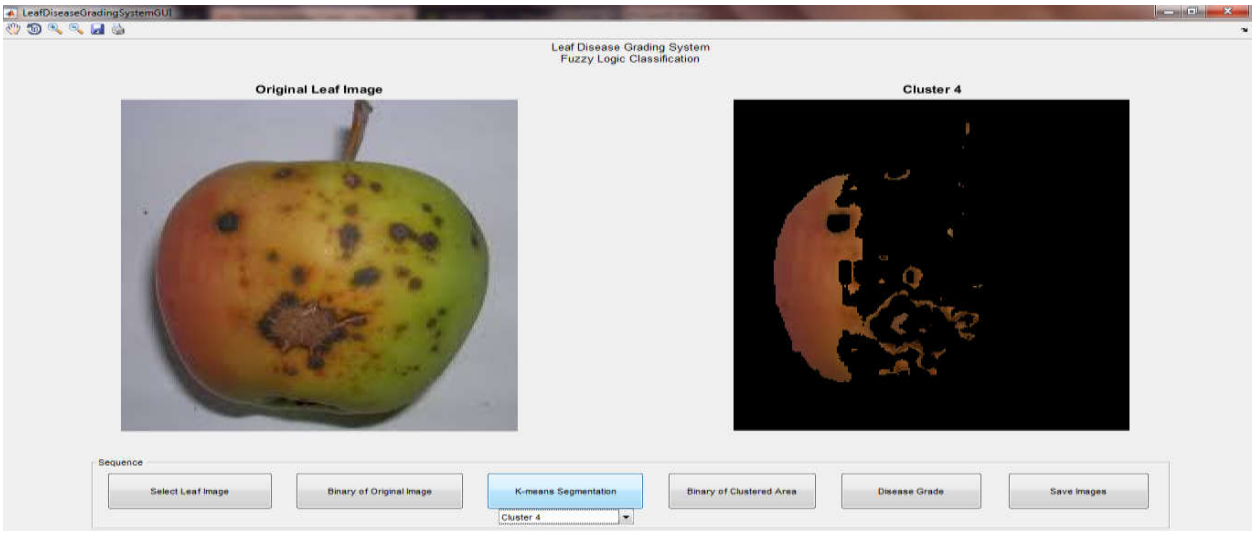


Figure 4.7 Cluster (4) formations in segmented image

The centers points are placed as far as possible from each other. The immediate step is to retrieve every point that is belonging to the specified data set and to map it to the closest center. Likewise, there is no point is left unassociated to the nearest point that the first step is done and prior grouping is completed. In this stage a new k centroid is calculated as the center of mass of two multiple clusters are attained from the previous step. New relation have to be formed among the similar data set, it is all done once the k new centroid is formed. The k-means algorithm comes to a conclusion that the data features are used to form the vector space. With result of this presumption it attempts to find the spontaneous clustering in them. The objects in the segmented data are grouped i.e. clustered around the centroid. Figure 4.8 shows the cluster formation in the final stage where the groupings of defective pixels are joined together.

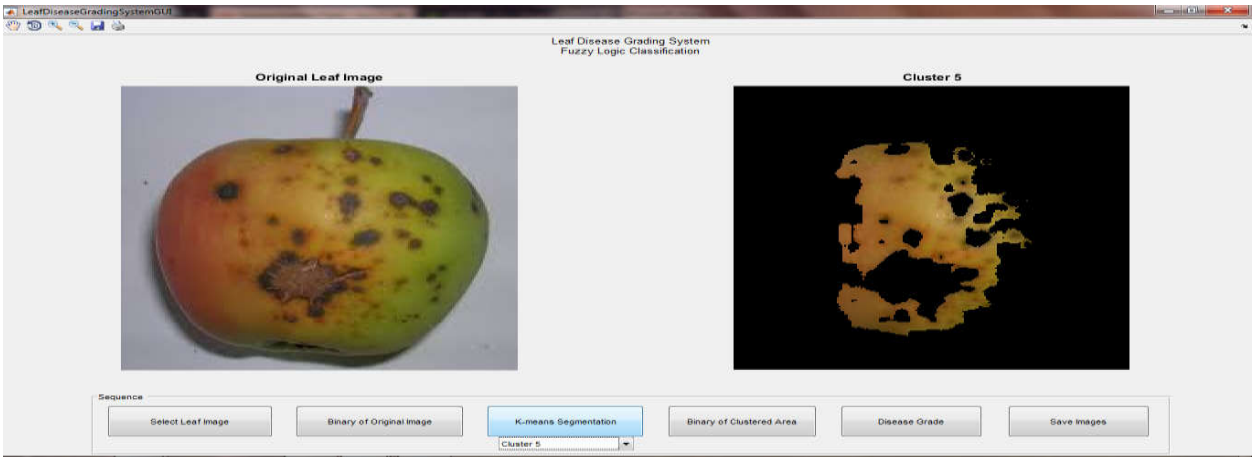


Figure 4.8 Cluster (5) formations in segmented image

Feature extraction is the task of selecting the desired feature from the pre-processed data set. It is done by retaining the necessary information from the large data set which contains variety of images. There are abandon amount of feature extraction systems available to extract the features like color, texture and shape as a feature vector. Feature extraction is executed to reduce the amount of data used in the data set so as to minimize the resources employed in analyzing the data exactly. In the proposed research work gray level co-occurrence matrix (GLCM) feature extraction algorithm is applied. This algorithm is also known as co-occurrence distribution. The grey level co-occurrence matrix algorithm is the traditional numerical method for analyzing the texture in the image.

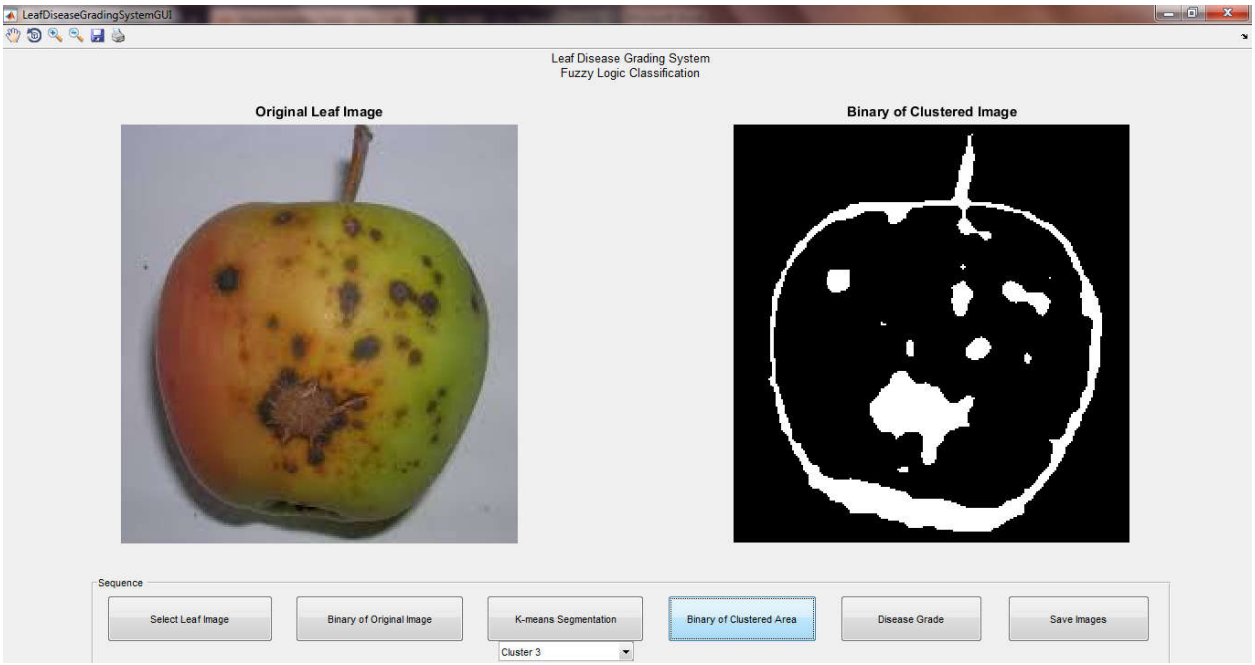


Figure 4.9 Feature Extraction

It is very important to grade the fruit before sending it to the market by the farmers. So, that farmer can estimate the price that can be fixed for their product. The proposed system includes the process of grading the fruit by taking the low or high scale which completely based on the geometric features of the fruit. The geometric features are area and the major axis. The physical feature of the fruit size determines the grade of it. The process of classification and grading are done by involving fuzzy logic by the proposed system. The following figure 4.10 shows the graph of the fruit grading system.

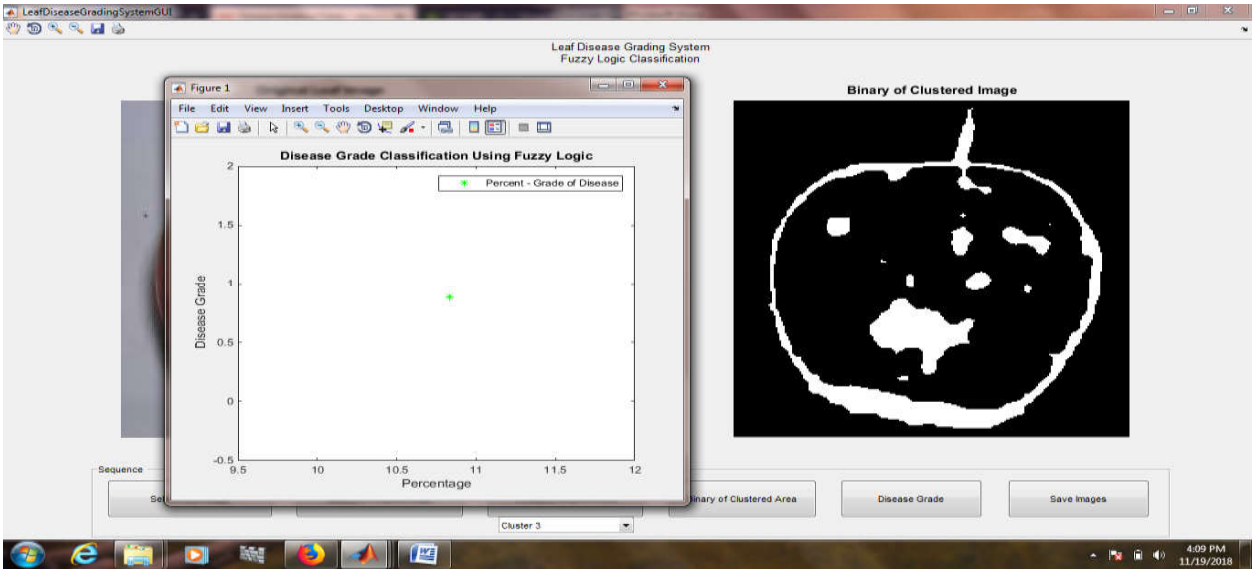


Figure 4.10: Graph of disease grading

The following figure 4.11 shows the final Result of grading System. The grading system proposed by involving the fuzzy logic has efficintly graded the loaded image as Black Rot disease. The database in the system design is mapped as number two for the black rot disease. The output from the grading system show the percentage of infevtion as 10.830866, where the accuracy of infection percentage is good when compare with other grading system. The identifiaction of the disease by the proposed fuzzy logic techniue for the loaded image is 100% accurate.

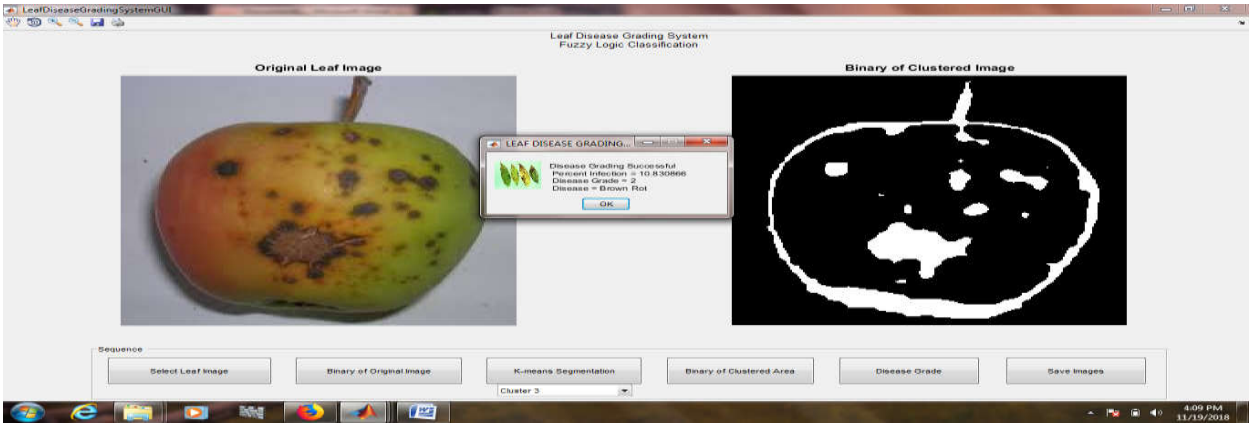


Figure 4.11 Grading of Disease

The graded image is converted into a binary image so that the infected region in the loaded image can be identified and the burden of the system is reduced so to make the process quicker. The following figure 4.12 shows the output of binary of clustered image.

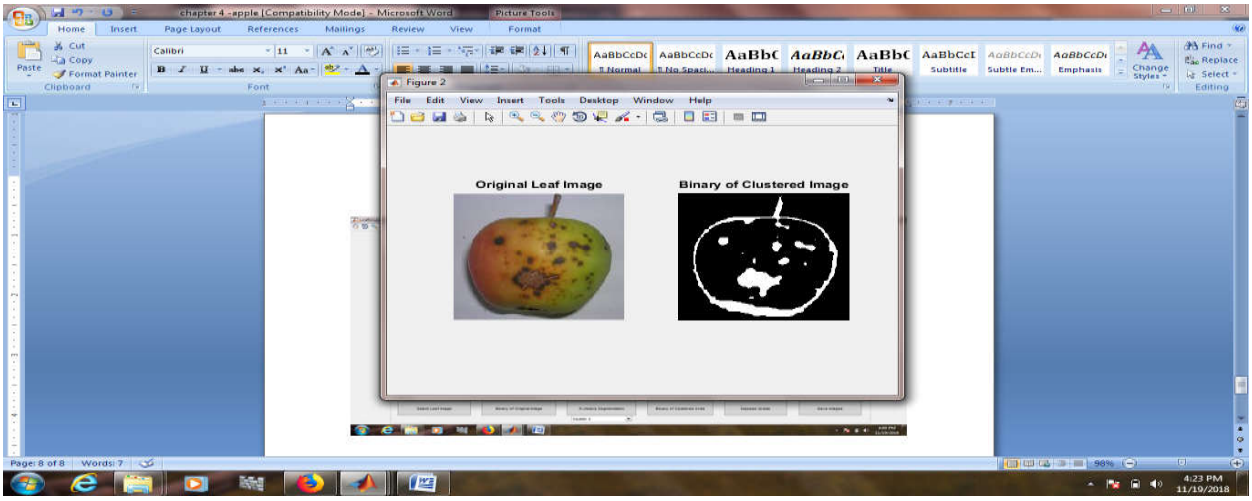


Figure 4.12 Binary of clustered Image

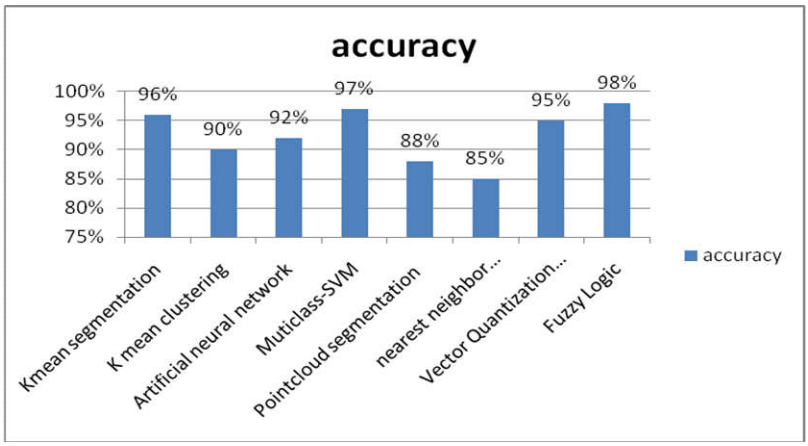
The proposed system is compared with various existing data mining techniques that are used to identify the apple fruit diseases. Though the performance analyses of different data mining techniques are considerably good still, there are many defects in them. The proposed system when compared with these existing methods shows better result with performance rate of 98%. The following table: 1 shows the comparison of various data mining techniques with the proposed system. The table also displays the accuracy rate of compared techniques along with proposed system.

Author& proposed year	Data mining techniques	accuracy
Chithra, & Henila, M. (2017)[1]	K-mean segmentation	96%
Suraj khade.,et.al(2016)[2]	K mean clustering	90%
Varughese, et.al(2016)[3]	Artificial neural network	92%
Dewliya,&Singh, (2015)	Muticlass-SVM	97%

[4]		
Cupec, R., Filko et.al. (2014)[5]	Pointcloud segmentation	88%
Arlimatti, S. R. (2012)[6]	nearest neighbor classifier	85%
Dubey, S. R., & Jalal, A. S. (2012) [7]	Vector Quantization Neural Network	95%
Proposed Work	**Fuzzy Logic**	98%

Table 4.1: Comparision of various Data mining Techniques

The table 1 shows the accuracy of existing methods. The Fuzzy Logic produced the highest accuracy than other methods in data mining. The next level of accuracy is achieved by K mean segmentation. The figure 2 shows the comparison chart of accuracy of data mining methods. However the existing algorithms have very low execution time and low quality of grading.



Conclusion:

The grading system proposed by involving the fuzzy logic has efficintly graded the loaded image as Black Rot disease. The output from the grading system show the percentage of infevtion as 10.830866, where the accuracy of infection percentage is good when compare with other grading system. The identifiaction of the disease by the proposed fuzzy logic techniue for the loaded image is 100% accurate.

References:

1. Dubey, S. R., & Jalal, A. S. (2012, November). Detection and classification of apple fruit diseases using complete local binary patterns. In *Computer and Communication Technology (ICCCT), 2012 Third International Conference on* (pp. 346-351). IEEE .
2. Sankaran, S., Mishra, A., Ehsani, R., & Davis, C. (2010). A review of advanced techniques for detecting plant diseases. *Computers and Electronics in Agriculture*, *72*(1), 1-13.
3. Al-Hiary, H., Bani-Ahmad, S., Reyalat, M., Braik, M., & ALRahamneh, Z. (2011). Fast and accurate detection and classification of plant diseases. *Machine learning*, *14*(5).
4. Arivazhagan, S., Shebiah, R. N., Ananthi, S., & Varthini, S. V. (2013). Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features. *Agricultural Engineering International: CIGR Journal*, *15*(1), 211-217.
5. Ananthi, S., & Varthini, S. V. (2012). Detection and classification of plant leaf diseases. *International Journal of research in engineering & applied Sciences*, *2*(2), 763-773.
6. Rumpf, T., Mahlein, A. K., Steiner, U., Oerke, E. C., Dehne, H. W., & Plümer, L. (2010). Early detection and classification of plant diseases with Support Vector Machines based on hyperspectral reflectance. *Computers and Electronics in Agriculture*, *74*(1), 91-99.
7. Patil, J. K., & Kumar, R. (2011). Advances in image processing for detection of plant diseases. *Journal of Advanced Bioinformatics Applications and Research*, *2*(2), 135-141.
8. Camargo, A., & Smith, J. S. (2009). Image pattern classification for the identification of disease causing agents in plants. *Computers and Electronics in Agriculture*, *66*(2), 121-125.
9. Barbedo, J. G. A. (2013). Digital image processing techniques for detecting, quantifying and classifying plant diseases. *SpringerPlus*, *2*(1), 660.
10. Kulkarni, A. H., & Patil, A. (2012). Applying image processing technique to detect plant diseases. *International Journal of Modern Engineering Research*, *2*(5), 3661-3664.