Scientific Journal of Impact Factor (SJIF): 5.71
e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 5, Issue 02, February -2018

Pomegranate Fruits Disease Classification with Fuzzy C Mean Clustering

[1]Shivanand B Lamani, [2]Ravikumar K, [3] Arshi Jamal

Faculty in Computer Science Dept, Akkamahadevi Women's University, Vijayapur
Asst Professor in Computer Science Dept, GFGC, Gangavati, India
Asst Professor in Computer Science Dept, ,GFGC, Sindhanur, India

Abstract: *The Identification of pomegranate fruit disease (bacterial blight, scab etc.) and also the remedy for that disease after identification are proposed. Bacterial Blight disease needs to control at initial stages otherwise it makes economic loss to farmers. The captured image of the diseased fruit uploads to the system. The system then makes the image processing and makes the classification of fruit is infected. In Proposed system comparative accuracy analysis is done using fuzzy mean segmentation and also with different classifiers like PNN (Probabilistic Neural Network), KNN (K Nearest Neighbors') and SVM (Support Vector machine). To achieve more accuracy closed capturing system, with high resolution camera is used, due to this capturing system 99% accuracy is achieved.*

***Keywords**:*

I. Introduction

1.1 Introduction

India is among the country where most of the people depend on agriculture. And the major area which decides economy of the nation is agriculture. The agricultural yield's quality and production quantity is affected by ecological parameters like temperature, rain and other climate related parameters which are out of control of human beings. Another major factor which affects productivity of the yield is the disease ;in this factor we can have control to improve the productivity for quality as well as for quantity of yield.

The main threat for pomegranate cultivation is diseases and insect pests. Thereforetimely correct diagnosis and careful treatment essential to defend the yield fromseveredamage and severe loss. Plants diseases may be found in stem, leaves andfruit. Bacterial Blight, Alternaria and Scab are major diseases that affectsthe pomegranate fruits. The diseasesaffects to neighbourhealthy pomegranate plants via wind, sprayed rain and through infected cuttings. In destructive diagnosis methods first the fruit is removed from plant and then measured. In non-destructive methods dimensions of fruit are measured without removing the fruit.The technology makesfarmers to check the possibility of diseases at primary stagesand make possible treatment. A methodology is developed to determine the type of disease the fruit is affected.

For prevention of disease, it is required to be detected at early stage so that treatmentcan be done properly andavoid spreading of the disease. Advances technologies makes it possible to use the images of diseased fruitand detect the type of disease. This achieved by using image processing technology, where features extracted from the images and further used with classification algorithms to make identification.Controlling the diseases is a challenging and most vital taskwhich can be achievedby proper Disease management. This challenge can be made easy by using image processing for detecting diseases of fruit. With this system it is possible to detect type of disease, theaffected area and severity of the disease.

Pomegranates are among the healthiest fruits. Pomegranateshave a range of beneficial plant compounds, incomparable with other foods. Researchstudies found that they have incredible benefits for human body, and lowers the risk of all sorts of diseases. Human being can enjoy pomegranates; get benefits of pomegranates by consuming in the syrup or eating seeds, juice, paste etc. For cartilage related problems and at baby'sbirth time brain damage problempomegranate is beneficial.

1.2 The most common diseases on Pomegranate are:

ANTHRACNOSE

Symptoms : Small, regular to irregular black spots on fruits which turnlater on as dark brown depressed spots.

Figure.1(a)

Prevention: Spraying of Difenconazole 25 EC at 1.0 ml/lit or Prochloraz 45 EC at 0.75ml/lit were effective against anthracnose disease.

(a) Anthracnose (b) Bacterial Blight (c) Scab

Figure 1.1 Pomegranate Deseases and symtoms

prevent the spores from germinating or penetrating leaf tissue. To be effective, they must be applied to the surface of susceptible tissue before infection occurs.

1.3 Problem Statement

India now one of thefast developing nation. This growth,agricultural field haveforemost impact. Intelligent farming assisting farmers with image processing based smart tools and automatedartificial intelligenttools that effortlessly combine production, information and dealsto improved production, yield quality and income. The traditional approach ofrecognition of fruit infections is using the bare eye analysisfrom the professionalspecialists. Consulting professional experts iscostly and time takingbecause to the unavailability of expert in nearby locations. Classification of fruit diseases and automatically detecting the symptoms as earliest as possible is very important.

II. IMPLEMENTATION

The implementation phase is translating design specification into actual source code, testing and running. The basicaim of software implementation is creationof source code that is easy to read and understand. After designingthe model and executionplan, finalizing specification standards, algorithm to be used the final phase is implementation. The user requirement specifications and the support from management is very important while implementation. User involvement in the design and implementation is very much beneficial, users can guide in implementation according to business requirements and importance, merging the user ideas and expertise ideas results into superior solutions.

2. 1 Image Pre-processing

Image pre-processing aimsto removesunwanted areas from image or image features improve which are helpful for processing of remaining steps and to perform analysis task. Image pre-processing do not affect toinformation matter of image. The background is removed using thresholding.Background removed from top, left, bottom and right without affecting fruit area.

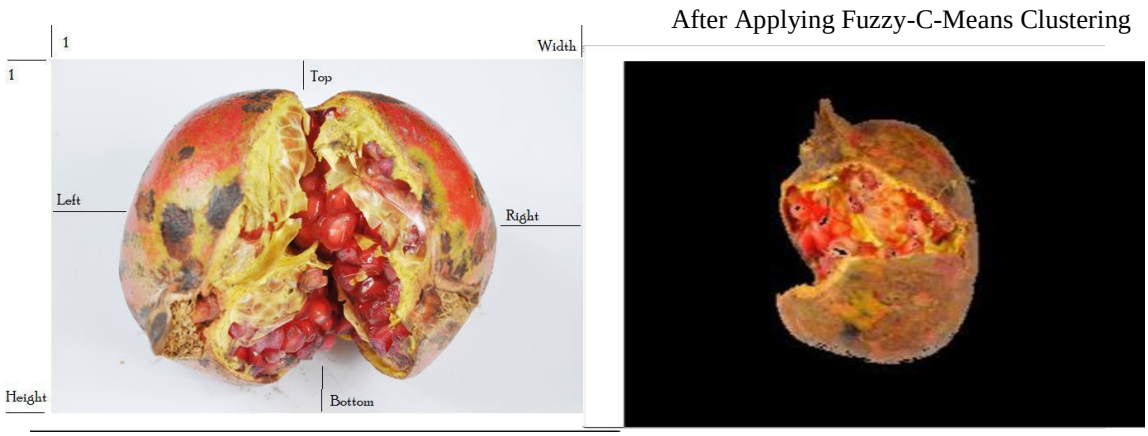


Figure 2.1 removal of background

Pseudo Code

```
%Remove from Left

for i=1 to Height

        for j=1 to Width
                if R,G,B >= 170
                        set pixel to black i.e make R,G,B as 0

else
break;
            end
    end

end

%Remove from Right

for i=1 to Height
        for j=Width to 1
                if R,G,B >= 170
                        set pixel to black i.e make R,G,B as 0
else
break;
                end

        end
end

%Remove from Left

for j=1 to Width

        for i=1 to Height
                if R,G,B >= 170
                        set pixel to black i.e make R,G,B as 0
else
break;

                end
        end
end

%Remove from Bottom

for j=1 to Width
for i=Height to 1
                if R,G,B >= 170
                        set pixel to black i.e make R,G,B as 0
else

break;
                end
        end
end
```

2.2 Segmentation

Image segmentation makes collections of homogeneous pixels in a regions depending on common similarities. Common similarities may be in terms of pixel colours, texture etc. It's important and must to simplify the image so that, the analysis of image becomes easier and efficient, and this is done by making use of segmentation process. Segmentation makes indirectly separating objects and recognising edges of objects in given image.

If only a certain region of an image is important and the rest can be discarded, segmenting the image into different regions is essential. The goal is to segment colour image in an automated fashion using K-means clustering or Fuzzy C Mean clustering. The clustering can be stated as, "the process of organizing objects into groups whose members are similar in some way".

Pseudo Code for K-Means Clustering

```
I=Fruit_I;

mu,mask]=kmeans2(rgb2gray(I),3);

Iseg = label2rgb(mask); %Image After Aplying K-Means Clustering
```

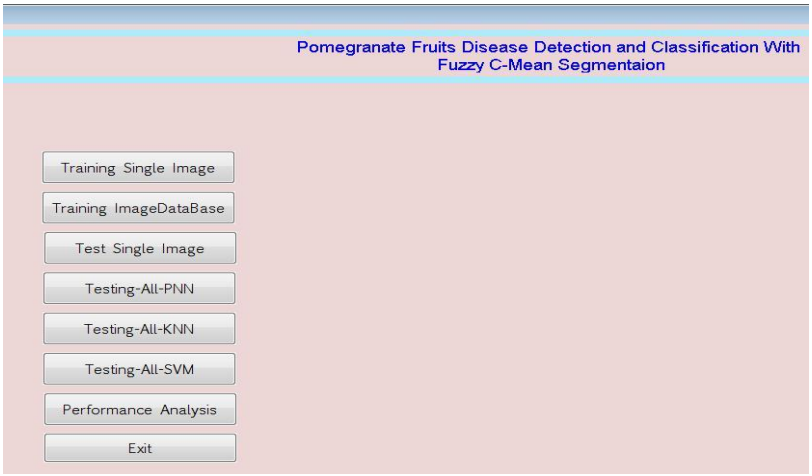
Pseudo Code for Fuzzy C Means Clustering

```
I=Fruit_I;

H=I(:,:,3);

data = im2double(H(:));

[center,U,obj_fcn] = fcm2(data,3,[2.0 NaN NaN 0]); maxU = max(U);

index1 = find(U(1,:) == maxU);

index2 = find(U(2,:) == maxU);

index3 = find(U(3,:) == maxU);

%  Assigning pixel to each class by giving them a specific value
fcmImage(1:length(data))=0;

fcmImage(index1)= 1;
fcmImage(index2)= 0.8;
fcmImage(index3)= 0.6;
 %  Reshapeing the array to a image
imagNew = reshape(fcmImage,size(I,1),size(I,2));
imagNew=im2uint8(imagNew);
Iseg = label2rgb(imagNew); %Image after Fuzzy-C-Means Clustering
```

III. Results And Analysis

3.1 Fuzzy-C-Mean Results and Analysis

3.1.1 Main GUI for Fuzzy C Mean



Snapshot 3.1.1: Main GUI for Fuzzy C Means

The above snapshot 3.1.1shows the Main GUI for Classification by using fuzzy C Mean Clustering.

Training Single Image Button - One image feature extraction done at a time

Training Image Database Button – Automatically extracts the fetures for images from training set.

Test Single Image Button – Single Image is tested for classification using PNN, KNN or SVM.

Testing-All-PNN Button – Automatically makes testing of all images from testing set using PNN and stored the performance analysis data in fc_pnn_analysis for further comparison.

Testing-All-KNN Button – Automatically makes testing of all images from testing set using KNN and stored the performance analysis data in fc_knn_analysis for further comparison.

Testing-All-SVM Button – Automatically makes testing of all images from testing set using SVM and stored the performance analysis data in fc_svm_analysis for further comparison.
Performance Analysis Button – Using the Analysed data from fc_pnn_analysis, fc_knn_analysis and fc_svm_analysis makes tabulations and plots comparative graphs.

3.1.2 GUI for Single Image feature extraction

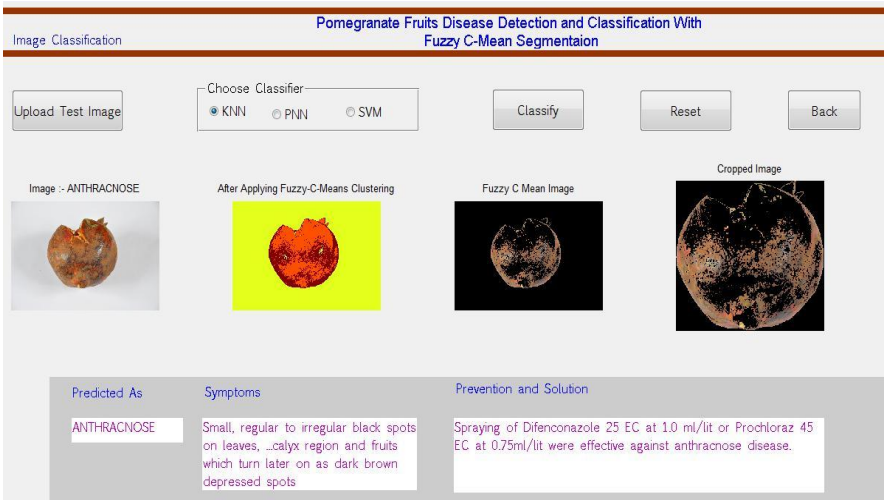
Snapshot 3.1.2: GUI for feature extraction using Fuzzy C Means

The snapshot 3.1.2shows the GUI for single image features extraction by using fuzzy C Mean Clustering.

Upload Image Button – for Selecting Image.

Process Image – Makes pre-processing, Fuzzy C Means clustering and cropping. Feature Extraction – Extracted features from processed image.

3.1.3 GUI for Single Image Testing



Snapshot 3.1.3: GUI for testing Single Image using KNN, PNN or SVM

The snapshot 3.1.3 shows the GUI for single image testing.

Upload Image Button - for Selecting Image. Choose Classifier - Select classifier for testing

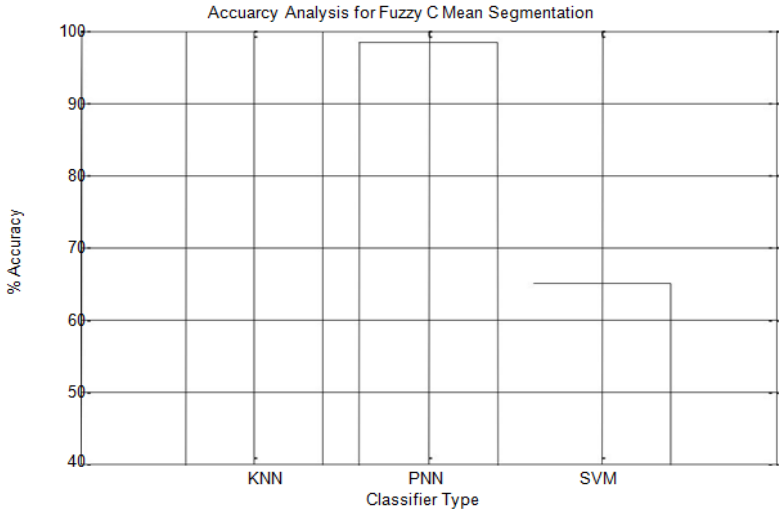
Classify Button – Classifies the image according to selected classifier and shows results as in figure 3.1.3.

3.1.4Result Analysis

Perfomance Analysis - With Fuzzy C Mean Segmentation

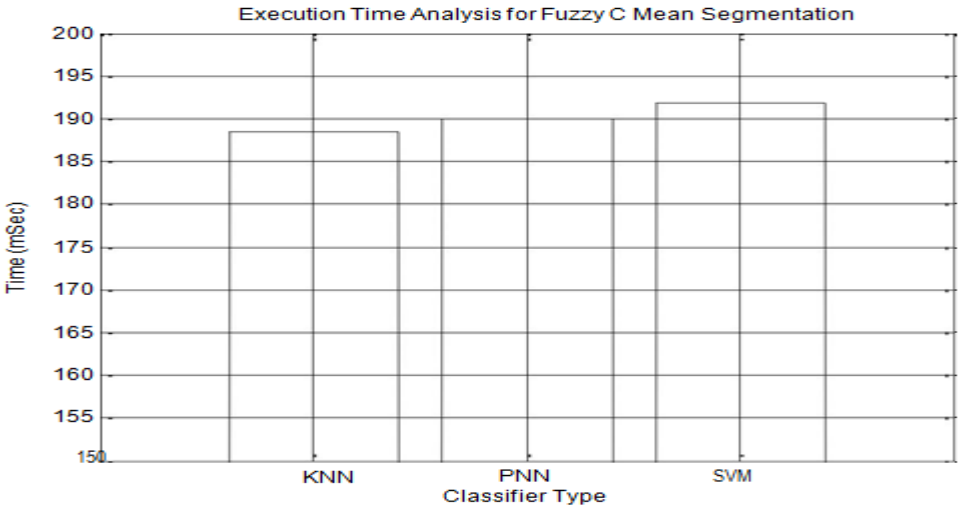
	TP	FN	TN	FP	Accuracy	Precision
KNN	60	0	0	0	100	100
PNN	59	1	0	0	98.3333	100
SVM	39	21	0	0	65	100

Snapshot 3.1.4: Accuracy analysis using KNN, PNN or SVM

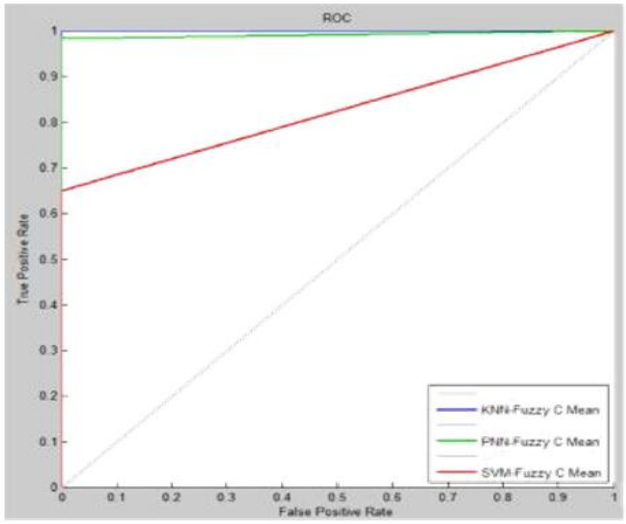


Snapshot 3.1.5: Accuracy graph of KNN, PNN or SVM

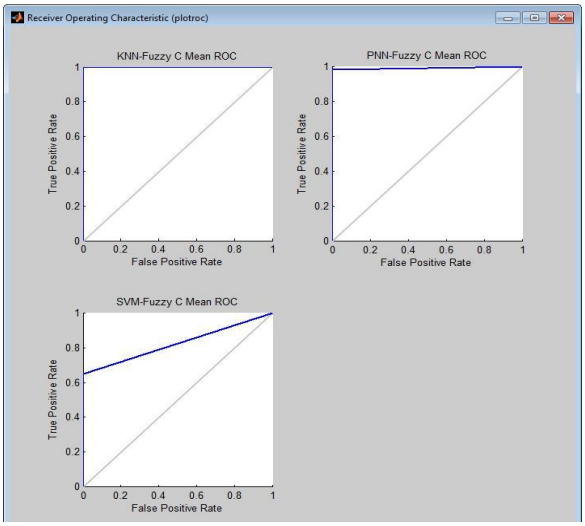
The snapshot 3.1.4, 3.1.5 shows that in Fuzzy C Mean with KNN has 100% accuracy and SVM has least accuracy for considered test images.



Snapshot 3.1.6: Execution time analysis of KNN, PNN or SVM with Fuzzy C Mean



Snapshot 3.1.7: Comparative ROC curve for KNN, PNN or SVM with Fuzzy C Mean



Snapshot 3.1.8: Individual ROC curve for KNN, PNN or SVM with Fuzzy C Mean

IV. Conclusion

Current scenario Suggest to have an approach to automatically grade the disease on plant. The disadvantages of manual grading can be overcome by using this automated system and may aid the pathologists in terms of making accurate diagnosis. The proposed system implemented by considering fruit features that can be extracted using fuzzy C mean and K means approaches. These approaches have been used for the identification of fruit disease types. The diseases that are affected on pomegranate fruit have been identified using KNN, PNN and SVM classifiers.

The results analysis shows that the results found are accurate and acceptable. Once the disease is identified the symptoms and prevention treatment solution provided to prevent further loss. Result analysis shows the KNN and PNN approaches are good.

References

[1] Khot.S.T, Patil Supriya, Mule Gitanjali, Labade Vidya, Pomegranate Disease Detection Using Image Processing Techniques ,International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 5, Issue 4, April 2016.

[2] Swati Dewliya, Ms. Pratibha Singh, Detection and classification for apple fruit diseases using support vector machine and chain code, International Research Journal of Engineering and Technology (IRJET) ,Volume: 02 Issue: 04 | Aug-2015.

[3] Tejal Deshpande1, Sharmila Sengupta2, K.S. Raghuvanshi, Grading & Identification of Disease in Pomegranate Leaf and Fruit, International Journal of Computer Science and Information Technologies, Vol. 5 (3), 2014

[4] Monika Jhuria, Ashwani Kumar, Rushikesh Borse,"Image Processing For Smart Farming: Detection of Disease and Fruit Grading", IEEE, Proceedings of the 2013 IEEE Second International Conference on Image Information Processing, 2013

[5] Jagdeesh D. Pujari, Rajesh Yakkundimath , Abdulmunaf S. Byadgi, "Statistical Methods for Quantitatively Detecting Fungal Disease from Fruit's Image", International Journal of Intelligent System and Application in Engineering,vol.1(4),60-67,2013

[6] Shiv Ram Dubey, Anand singh Jalal, "Detection and Classification of Apple Fruit Diseases using Complete Local Binary Patterns" IEEE, Third international conference on Computer and communication Technology, 2012

[7] Ilaria Pertot, Tsvi Kuflik, Igor Gordon, Stanley Freeman, Yigal Elad, Identificator: A web-based tool for visual plant disease identification, aproof of concept with a case study on strawberry, Computers and Electronics in Agriculture, Elsevier, 2012, Vol.88, p.144-154.

[8] Xiaoou Tang, Fang Wen, IntentSearch: Capturing User Intention for One-Click Internet Image Search, IEEE transactions on pattern analysisand machine intelligence, 2012, vol.34, p.1342-1353.

[9] Parag Shinde, Amrita Manjrekar, Efficient Classification of Images using Histogram based Average Distance Computation Algorithm Extendedwith Duplicate Image Detection Elsevier, proc. Of Int. Conf. On advances in Computer Sciences, AETACS, 2013.

