Segmentation based Anthracnose Deceases Detection in Fruits and Plants

Anurag Chodery[1] Prof. Amit Thakur[2]
[1]Research Scholar [2]Assistant Professor & Head of Dept.
[1,2]Department of Computer Science & Engineering
[1,2]Swami Vivekanand College of Science & Technology Bhopal, (SVCST), Bhopal, India

Abstract— Anthracnose. Fungal, virus deceases detection is one of the important part of plants and fruits processing. Now a days required bacterial and fungal infection in increases day to day and destroy the crops and fruits. That's why the detection of deceases is an important part of the food processing engineering. There are different techniques are available Deceases Detection in crops and fruits using digital image processing. In this paper discuss the different method for Anthracnose deceases in plants and crops. In this paper presented a deceases detection in plants and crops in fields like performing proposed work. Alternaria Alternata, Anthracnose, Bacterial Blights. For the detection effected area of plants using segmentation by clustering method. Shows that deceases can be detected with an awfully high accuracy, up to 90% in the different test images of plants, leafs and fruits. The validation tests showed that detect deceases plants so avoiding 3D sensing. Color based classification is highly enthusiastic about the quality of the color perception that demands use of cameras with fine-tuned and label color filters. Environmental factors, such as sunlight, still pose the biggest challenge for different deceases detection. Presented work additionally detect the deceases in fruits as well as area of effected fruits.

Key words: Anthracnose. Fungal, Bacterial Blight, Leaf Spot, Leaf Diseases and Texture Features

I. INTRODUCTION

India is an agricultural country; wherein about 70% of the population depends on agriculture. Farmers have wide range of diversity to select suitable Fruit and Vegetable crops [1]. The aim of research in agriculture is to increase the productivity and food quality at reduced expenditure and with increased profit because in India most of the population depends on agriculture. Vegetables and fruits are the most important agricultural products. Agricultural production mainly depends on the quality of seed, soil etc. In order to obtain more valuable products, a product quality control is basically mandatory. The quality of agricultural products may be reduced due to plant diseases. Plant diseases interrupt its vital functions such as photosynthesis, transpiration, pollination, fertilization, germination etc. These diseases are caused by pathogens viz., fungi, bacteria and viruses, and due to adverse environmental conditions. Therefore, the early stage diagnosis plays an important role in plant disease detection. In plant, diseases can be found in various parts such as fruit, stem and leaves. [1]

Anthracnose is a group of fungal diseases that affect a variety of plants in warm, humid areas. Commonly infecting the developing shoots and leaves, anthracnose fungi (usually Colletotrichum or Gloeosporium) produce spores in tiny, sunken, saucer-shaped fruiting bodies known as acervuli. It causes dark, sunken lesions on leaves, stems, flowers, and fruits. It can spread very quickly during rainy seasons. On leaves, anthracnose generally appears first as small, irregular yellow or brown spots. On fruits, it produces small, dark, sunken spots, which may spread. In moist weather, pinkish spore masses form in the center of these spots. Eventually, the fruits will rot.

Anthracnose diseases may infect leaves, twigs, buds, shoots, and even the fruit of various landscape trees. Repeated Anthracnose infections can weaken a tree and cause it to be more susceptible to attack by insect pests or to decline due to adverse environmental conditions. Anthracnose spores overwinter on fallen leaves, on infected buds, and in cankers on infected twigs. In the spring these spores are blown or splashed onto newly emerged leaf tissue. If the weather is cool and moist the spores will germinate and infect the tender leaf tissue. The position of any country in the world depends on its economy which in turn depends on agricultural production in many countries like India. Also in India most of the population depends on agriculture for a livelihood. The quality and quantity of the agricultural production is affected by environmental parameters like rain, temperature & other weather parameters which are beyond the control of human beings. Anthracnose has a large possibility to decrease the agricultural production significantly. For a country like India whose major occupation is agriculture, it is necessary to prevent crops from getting affected or try to detect and treat crops affected by anthracnose.

Recognition system is a challenge for the computer vision to achieve near human levels of recognition. The fruits and vegetable classification is useful in the supermarkets where prices for fruits purchased by a client can be defined automatically. Fruits and vegetable classification can also be utilized in computer vision for the automatic sorting of fruits from a set, consisting of different kind of fruits. Picking out different kind of vegetables and fruits is a recurrent task in the supermarkets, where the cashier must be capable to identify not only the species of a particular fruit or vegetable (i.e., banana, apple, pear) but also identify its variety (i.e., Golden Delicious, Jonagold, Fuji), for the determination of its cost. This problem has been solved for packaged products, but most of the time consumers want to pick their product, which cannot be packaged, then it must be weighted.

II. LITERATURE REVIEW

In this part of this survey paper discuss the some lastest techniques for the plant deaceseas detection. There are many methods are introduced of deaceses detection in the last decade. In this survey paper discuss some of them.

A. Method - Fruit Image Analysis victimization Wavelets [2016]

This reserch works contains a description of analysis administrated by the Department of information Science and hot Research in the space of wavelet-based image processing techniques and neural networks to develop a method of on-line identification of tormentor harm in pip fruit orchards.

All rights reserved by www.ijsrd.com

The results of the project are encouraging and have guaranteed additional investigation into this difficult task. Detailed the image processing, and neural network classification strategies applied to the task of identifying the persecutor that caused the injury to apple fruits and leaves in orchards. Even at this stage in the research it can be seen that the feasibility of victimization these techniques is kind of encouraging. Given the high classification rate on a standard neural network without any special alteration to the educational algorithmic program, or any other complementary information concerning the character of the images, it can be seen that this direction should provide even additional fruitful results. Consecutive step is to expand the image information base and expand the system to incorporate different information concerning the injury that can be input by the orchardist with the aim of accelerating the accuracy organization. There has already been some preliminary research into desegregation both audio and visual information to the problem of person identification, and this could also be applied to the problem of persecutor identification additionally. In this propose victimization rules in the variety of text instead of audio input via Matlab mathematical logic toolbox as shown in these rules could kind the basis of the foundations node in a Fuzzy Neural Network [4]

B. An Improved Leaf an Improved plant disease Detection victimization collection of features and SVM Classifiers" [2015]

Leaf diseases weaken trees and shrubs by interrupting activity, the strategy by that plants produce energy that sustains growth and defense systems and influences survival. Problem can be resolved once provided with the remedial action in time and this can be achieved with the introduction of technology in the system. This paper presents an improved methodology for plant disease detection victimization an accommodative approach. The algorithmic program given used to preprocess, section and extract information from the preprocessed image. The segmentation is completed victimization K-Means algorithmic program to realize completely different clusters. the form feature and color texture features are extracted from the affected reasons and send to the SVM classifier. The detection task performed and experimental results prove that the proposed methodology is efficient in reaching convergence. Keywords Image Processing; Leaf Diseases; plant disease. This work consists of 4 phases to identify the affected a section of the wellness. Initially preprocessing is completed which include 2 steps grey conversion and de-noising. Second stage is k-means primarily based Image segmentation which eventually does image analysis. Third stage is feature extraction {that includes that has that features} color features and form features. And subsequently classification of diseases is performed victimization our projected formula. The goal of this analysis work is to develop Advance automatic processing system which can verify the wellness affected a neighborhood of a leaf spot by victimization the image analysis technique. Prediction of the diseases and cuss recommendation is finished. The producers can amend the Yield and reduce the loss. Through this projected system the farmers' burden has been reduced and saves their life. Comparison of strategies shows that SVM classifiers perform higher than others. Accuracy of detection is enhanced once victimization SVM classifier with additional variety of features included to that. [5]

C. Color remodel primarily based Approach For wellness Spot Detection on Plant Leaf [2012]

In this analysis, an algorithmic program for wellness spot segmentation victimization image processing techniques in plant leaf is implemented. This is the primary and vital section for automatic detection and classification of plant diseases. Wellness spots are completely different in color but not in intensity, as compared with plant leaf color. So in this propose color remodel of RGB image can be used for better segmentation of wellness spots. In this paper a comparison of the effect of CIELAB, HSI and cyborg color space in the method of wellness spot detection is completed. Median filter is used for image smoothing. Finally threshold can be calculated by applying Otsu methodology on color component to observe the wellness spot. an algorithmic program which is independent of background noise, plant kind and wellness spot color was developed and experiments were administrated on completely different "Monocot" and "Dicot" family plant leaves with both, noise free (white) and noisy background. HSI and CIELAB color models are studied. all these color models are compared and eventually 'A' component of CIELAB color model is used. Color transformed image is more experienced median filter. In last, wellness spots are segmented by applying OTSU threshold on 'A' component of research laboratory color space. Experimental result shows that noise that is introduced attributable to background, vein and camera flash; can be done in victimization CIELAB color model (Method 4). Following this methodology completely different wellness spots are detected accurately and results are not affected by background, variety of leaf, variety of wellness spot and camera. Additional to the current it's required to cipher illness spot space for assessment of loss in agriculture crop. illness are often classified by conniving dimensions of wellness spot. in this work veins having color kind of like the spot is not considered. Additional work need to be administrated in those lines additionally. [6]

D. Method of Leaf Spot Disease Based on Image Processing Grading methodology of Leaf Spot [2008]

Wellness based on Image processing Since current grading of plant diseases is especially based on eyeballing, a brand new methodology is developed based on computer image processing. All influencing factors existed in the method of image segmentation was analyzed and leaf region was segmented by victimization Otsu methodology. in the HSI color system, H component was chosen to section wellness spot to reduce the disturbance of illumination changes and the vein. Then wellness spot regions were segmented by victimization sober operator to examine wellness spot edges. Finally plant wellness is stratified by conniving the quotient of disease spot and leaf areas. Researches indicate that this methodology to grade plant leaf spot diseases is fast and accurate. Plant wellness happen below natural conditions and their symptoms vary significantly below completely different and in the different stages of disease. Whether or not the image is segmented correctly or not determines the success or failure of the study. With the utilization of Otsu leaves are segmented. The white background is additional appropriate for image segmentation verified by experiments. Attributable

All rights reserved by *www.ijsrd.com*

to the variability of lesion symptoms, threshold segmentation is not appropriate for use. This paper presents to section lesion accurately by victimization sober operator to extract lesion edge and operations as region fill, morphology open operation in the H component. The usage of image processing technology for plant disease degree grading eliminates the subjectiveness of traditional classification strategies and human-induced errors. Therefore the estimation believability is improved and accurate information is provided for wellness studies. the strategy is additionally convenient, which simply needs computers, digital cameras with the combination of necessary code programs to appreciate for the wellness batch grading. [5]

E. Detection and Classification of Apple Fruit Diseases victimization Complete native Binary Patterns [2012]

Diseases in fruit cause devastating problem in economic losses and production in agricultural trade worldwide. in this paper, a solution for the detection and classification of apple fruit diseases is proposed and experimentally valid. The image processing primarily based proposed approach is composed of the subsequent main steps; in the commencement K-Means clustering technique is used for the image segmentation, within the second step some state of the art features are extracted from the segmented image, and eventually images are classified into one of the categories by using a Multi-class Support Vector Machine. Our experimental results specific that the proposed solution will significantly support correct detection and automatic classification of apple fruit diseases. An image processing primarily based solution is proposed and evaluated the proposed approach is composed of primarily 3 steps. In the initiative image segmentation is performed victimization K-Means clustering technique. In the second step features are extracted. In the third step training and classification are performed on a Multiclass SVM. In this paper found used 3 varieties of apple diseases namely: Apple Blotch, Apple Rot, and Apple Scab as a case study and evaluated our program. Our experimental results indicate that the proposed solution will significantly support automatic detection and classification of apple fruit diseases. Based on our experiments, in this paper found that standard apples are easily distinguishable with the diseased apples and CLBP feature shows additional correct result for the classification of apple fruit diseases and achieved more than 93 classification accuracy. Additional work includes consideration of fusion of more than one feature to enhance the output of the proposed methodology. [8]

F. Identification of Leaf diseases in tomato plant based on Wavelets and PCA [2011]

The recent development of photographic camera and growth of information storage has crystal rectifier to an enormous quantity of image databases. only a number of were proposed for specified databases such as satellite images, leaf sets, maps, faces, fingers and so on. There are plenty of content-based retrieval systems which are principally applied to general image databases (CBIR) and there are very few for plant databases. the utilization of plants is masses such as foodstuff, medication and trade. This has LED to the thought of characteristic the different diseases of a leaves of a plant available around USA which could be useful to the individual. impressed in the active field of CBIR, in this propose a brand new methodology for automatic identification of unhealthy leaves based on Wavelets and PCA. The information set considered in this paper is unhealthy Tomato leaves. This paper deals with a proposed methodology unhealthy tomato leaves and identify the wellness. Wavelets and PCA are used and therefore the implementation is completed in Matlab. this methodology verified to be very efficient and this work can additional be enhanced to an internet primarily based application where the user provides a pathological leaf as an input and therefore the system identifies the un-wellness and suggests consequently. The work in this paper is principally finished identification of diseases pertained to tomato leaves which can be additional enhanced to any leaves and inexperienced veggies which can be infected by similar diseases.[9]

III. PROPOSED EFFECTED AREA DETECTION AND AREA CALCULATION

A. Step 1 – Query Image Selection

First select the image from data set. The data set is the combination of the three types of images. There are different type of images in the data set. Data set contain different type of images like healthy leaf image and deceased leaf image.

B. Step 2- Apply Clustering Segmentation

Clustering is that the one among the unsupervised learning method for clusters. Cluster the image is grouping the pixels consistent with the same characteristics. Within the k-Means algorithmic program initially we've got to define the quantity of clusters k. Then k-cluster centre are chosen randomly. The gap between the every picture element to every cluster centres are calculated. The gap is also of straightforward geometrician perform. Single picture element is compared to all or any cluster centres mistreatment the space formula. The picture element is affected to explicit cluster that has shortest distance among all. Then the centre of mass is re-estimated. Once more every pixel is compared to all or any centroids. the method continuous till the middle converges. The K-means algorithmic rule implements a divisive clustering and was initial mentioned by Duda and Har. The algorithmic rule uses a similarity metric to assign all documents to at least one of k clusters. The clusters are drawn as a median of all documents contained among the cluster. This average may be thought of because the centre of mass of the cluster.

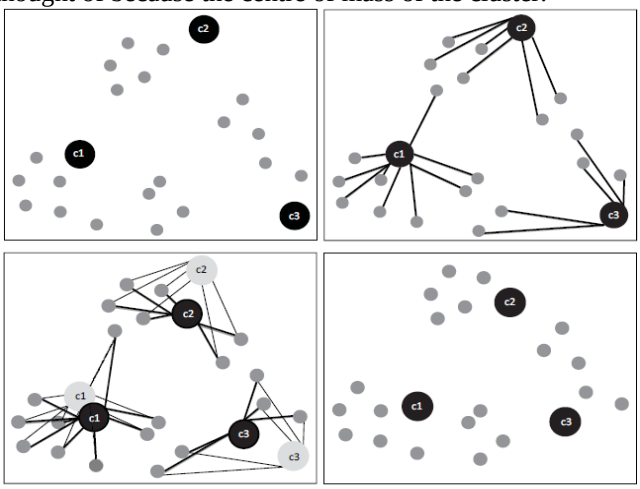


Fig. 1: Example of K-means output with K equal to four in two dimensions

All rights reserved by *www.ijsrd.com*

K-means clustering is the simple and fast clustering technique that has been largely used in different problem solutions. K-means assigns data point to cluster centroids to minimize the distance from data points to cluster centroids.

The K mean clustering is done in 3 steps:

- In the first step define initials centroids arbitrarily per cluster of arguments, called c1, c2 and c3 here.
- Assign closest points of the cluster to the centroid.
- Determine new centroid, by averaging data points from this cluster.
- Repeat until convergence of a specified number of iterations.

The K from "K means" comes from

The second continuous image f(x, y) is split into N rows and M columns. The intersection of a row and a column is termed as picture element. The worth assigned to the number coordinates [m, n] with and is f[m, n]. In fact, in most cases f(x, y) that we have a tendency to tend to might consider to be the physical signal that impinges on the face of a sensing element. Usually an image file like BMP, JPEG, TIFF etc., has some header and picture data. A header typically includes details like format symbol (typically initial information), resolution, range of bits/pixel, compression type, etc.

C. Step 4 Morphological Operations

Morphological operators usually take a binary image and a structuring part as input and fusion them using a set operator (intersection, union, inclusion, complement). They phenomena objects within the input image supported characteristics of its, form, which are encoded within the structuring part.

Usually, the structuring part is sized 3×3 and has its origin at the centre constituent. It shifted over the image and at every constituent of the image and its components are compared with the set of the underlying pixels. If the two sets of components match the condition outlined by the set operator (e.g. if the set of pixels within the structuring part may be a set of the underlying image pixels), the pixel beneath the origin of the structuring element is about to a pre-defined worth (0 or one for binary images). A morphological operator is thus outlined by its structuring component and therefore the applied set operator.

For the essential morphological operators the structuring part contains solely foreground pixels (i.e. ones) and `don't care's'. These operators, that are all a mix of abrasion and dilation, are usually accustomed choose or suppress options of an explicit form,

e.g. removing noise from images or choosing objects with a selected direction.

For the essential morphological operators the structuring part contains solely foreground pixels (i.e. ones) and `don't care's'. These operators, that are all a mix of abrasion and dilation, are usually accustomed choose or suppress options of an explicit form, e.g. removing noise from images or choosing objects with a selected direction.

The more sophisticated operators take zeros as well as ones and don't care's' in the structuring element. The most general operator is the hit and miss, in fact, all the other morphological operators can be deduced from it. Its variations are often used to simplify the representation of objects in a (binary) image while preserving their structure, e.g. producing a skeleton of an object using selection and tidying up the result using thinning. Morphological operators can also be applied to gray-level images, e.g. to reduce noise or to brighten the image. However, for many applications, other methods like a more general spatial filter produces better results

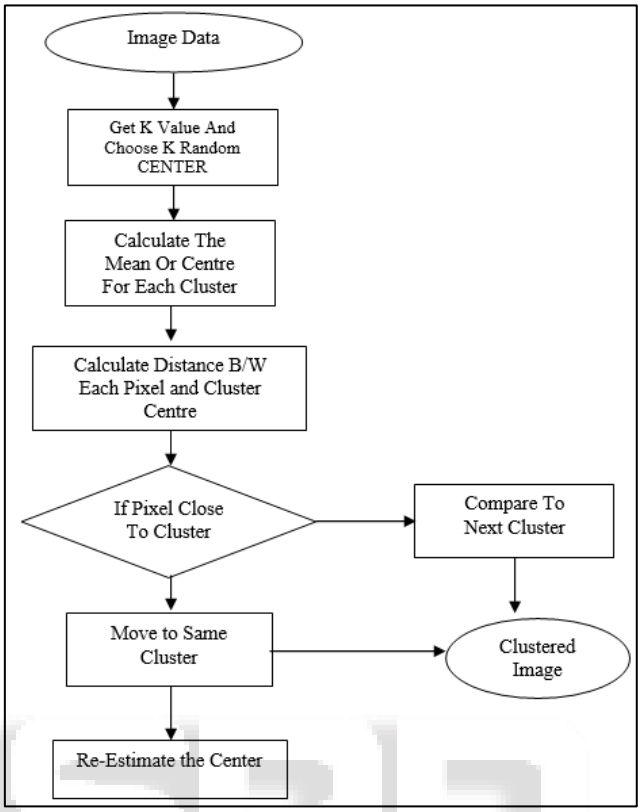


Fig. 2: Shows the Algorithm of K mean Clustering

D. Step Region of Interests (ROI)

ROI is a subdivision of an image or a database recognized for a specific determination. The dataset could be any of the following: Waveform or 1D dataset: The ROI is a time or frequency interval on the waveform (a graph of some quantity plotted against time). Image or 2D dataset: The ROI is defined by given boundaries on an image of an object or on a drawing.

- Volume or 3D dataset: The ROI is the contours or the surfaces defining a physical object.
- Time-Volume or 4D dataset: Concerning the changing 3D dataset of an object changing in shape with time, the ROI is the 3D dataset during a specific time or period of time.

There are three fundamentally different means of encoding a ROI:

- As an integral part of the sample data set, with a unique or masking value that may or may not be outside the normal range of normally occurring values and which tags individual
- Figure 2 Flowchart of k-means algorithm
- The above figure shows the flow chart use for the k-means clustering algorithm. The K-means clustering algorithm clusters data by iteratively computing a mean intensity for each class and segmenting the image by classifying each pixel in the class with the closest mean
- Like classifier methods, clustering algorithms do not directly incorporate spatial modelling and can therefore be sensitive to noise and intensity in homogeneities.

All rights reserved by *www.ijsrd.com*

A simple two dimensional case for K-means clustering is shown The K-means algorithm set with k = 4 results in four clusters represented by A, B, C, and D. The K-means algorithm operates as follows:

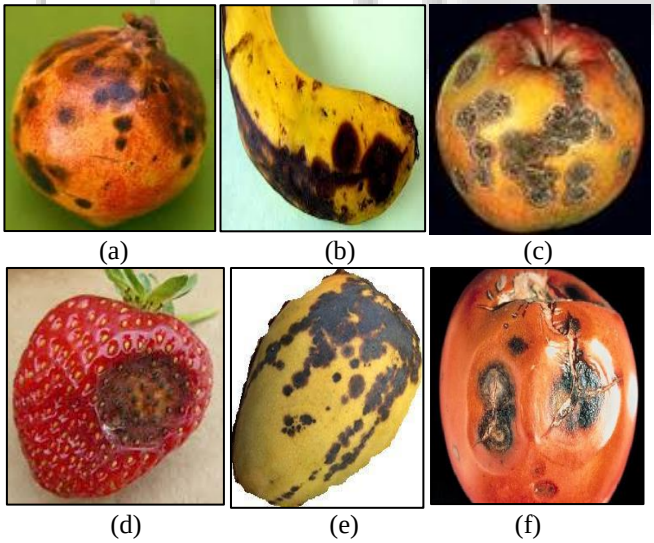
1) Assign document vectors, di 2 D, to a cluster using an initial seed.
2) Initialize cluster centroids, C, from initial document assignments.
3) For each document d 2 D
– Recalculate distances from document di to centroids (C1,C2,...,Ck), and find the closest centroid Cmin.
– Move document d from current cluster Ck into new cluster Cmin and re-calculate the centroid for Ck and Cmin.
4) Repeat step 3 until either the maximum epoch limit is reached or an epoch passes in which no changes in document assignments are made. An epoch is a complete pass through all documents.

IV. SIMULATION AND RESULTS

There are different leafs and fruits anthracnose deceases data set are taken for performing proposed work. Alternaria Alternata, Anthracnose. The proposed method calculate the area of effected part of fruits and plants. For the simulation of proposed method.

Use matrix lab. Software for simulation and analysis of proposed method. For testing purpose run proposed method at different deceases images of fruits. There images are collected with the help of different data sets. For better understand also create the GUI of proposed method. In the below figure shows the different Anthracnose deceases and other deceases effected images in below.

A. Anthracnose Deceases Data Set



(a) (b) (c)

(d) (e) (f)

Fig. 3: Shows the Alternaria Alternata deceases Fruits data set

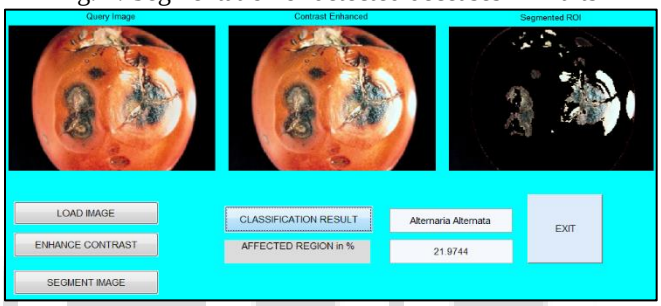
In the above figure 3 shows the Alternaria alternata deceases data set images.

In the above figure 3 shows the anthracnose deceases data set images. Anthracnose is a group of fungal diseases that affect a variety of plants in warm, humid areas. Commonly infecting the developing shoots and leaves, anthracnose fungi (usually Colletotrichum or Gloeosporium) produce spores in tiny, sunken, saucer-shaped fruiting bodies known as acervuli.

Fig. 4(a) Input image

(b) Effected Parts (c) Seni Effected Part (d) Healthy Parts

Fig. 4: Segmentation of detected deceases in Fruits

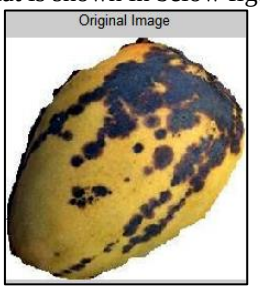


(e) Affected Region of fruits

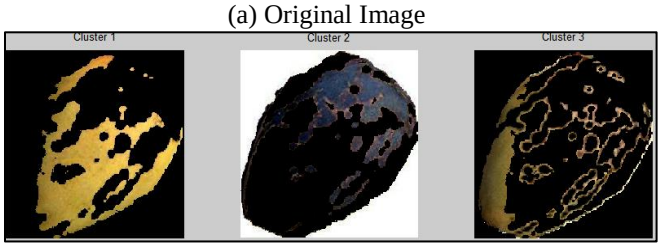
Fig. 5: Over all result of proposed method

In the above figure 4(a), shows the input image that is select for processing and effected by alternaria alternta. After the selected of input image apply contrast enhacement then apply segemntation of contrast enhanced part that gives three outputs that is shown in figure (b), (c) and (d). Figure 4(b) shows the deceases effected part 4(c) shows the semi effected part and 4(d) shows the uneffected parts. Figure 5(e) shows the over all results of proposed method that is calcuated the effected area part that is 21.9744mm^2.

After that shows the simulation and results of different images that is shown in below figures 6(a) to 8(f).



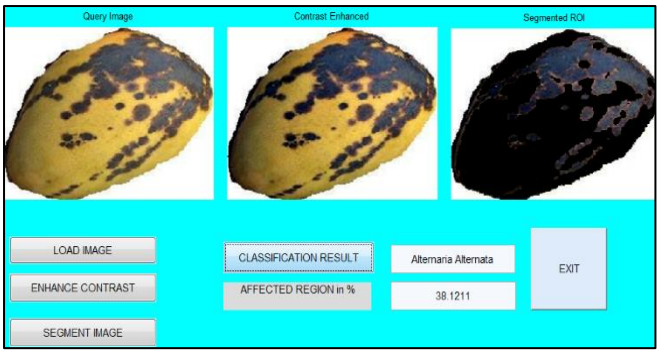
(a) Original Image



(b) Effected Parts (c) Seni Effected Part (d) Healthy Parts

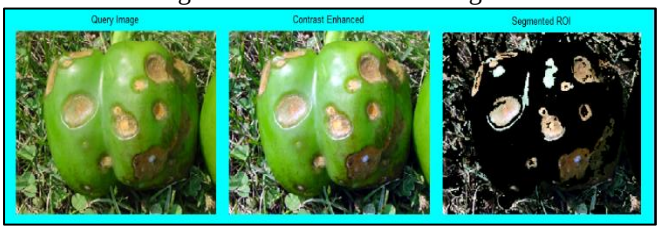
Fig. 6: Segmentation of detected deceases in Fruits

All rights reserved by *www.ijsrd.com*



(e) Affected Region of fruits

Fig. 7: Over all result of Mango



(f) Affected Area is: 15.0062%

Fig. 8: Over all result of Pepper

V. CONCLUSION

This paper shows an optimal performance, the task of deceases detection must be carried out at an earlier growth stage. This is also in line with the scientific discipline principles as the detected problems in plants early stage removed, the lesser is the production loss. For increasing the robustness against environmental factors of a field deployable system, classifiers must be trained or label in the field and setting and with the chosen imaging setup. Addition of shape feature may widen the scope by making it possible to include additional species, but the challenge of occlusion remains.

REFERENCES

[1] Zalak R. Barot1, Narendrasinh Limbad2Zalak R. Barot and Narendrasinh Limbad, "An Approach for Detection and Classification of Fruit Disease: A Survey ", International Journal of Science and Research (IJSR), 838 - 842, 2014.

[2] Shiv Ram Dubey, and Anand Singh Jalal, "Application of Image Processing in Fruit and Vegetable Analysis: A Review", Journal of Intelligent Systems, vol. 24, no. 4, pp. 405-424, 2015

[3] George T. Tziros, "Alternaria alternata causes leaf spot and fruit rot on loquat (Eriobotrya japonica) in Greece" Australasian Plant Pathology Society Inc., 123–124, 2013.

[4] A. Brendon J. Woodford Nikola K. Kasabov and C.Howard Wearing, "Fruit Image Analysis using Wavelets" Proceedings of the ICONIP /ANZIIS/ ANNES, 1999.

[5] Sandeep B. Patil, Santosh Kumar Sao, "An Improved Leaf Disease Detection Using Collection of Features and SVM Classifiers", International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 3 Issue VI, June 2015.

[6] Piyush Chaudhary, Anand K. Chaudhari, Dr. A. N. Cheeran and Sharda Godara, "Color Transform Based Approch for Disease Spot Detection on Plant Leaf", International Journal of Computer Science and Telecommunications, pp. 65-71, 2012.

[7] Weizheng S., Yachun W.,Zhanliang C.Hongda W. Grading, "Method of Leaf Spot Disease Based On Image Processing", International Conference on Computer Science and Software Engineering (ICCSSE), 2008.

[8] Shiv Ram Dubey, Anand Singh Jalal, "Detection and Classification of Apple Fruit Diseases using Complete Local Binary Patterns", International Conference on Computer and Communication Technology IEEE, 2012,

[9] D.N.D.Harini, D.LalithaBhaskari, "Identification of Leaf diseases in Tomato Plant based on Wavelets and PCA", World Congress on Information and Communication Technologies, IEEE 2011

[10] Agrios, George N. Plant Pathology. 5th Burlington, MA: Elsevier Academic Press, 2005

[11] https://www.gardeningknowhow.com/plant-problems/disease/cercospora-leaf-spot.html

[12] H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z. AL Rahamneh, "Fast and Accurate Detection and Classification of Plant Diseases", International Journal of Computer Applications (0975 – 8887) Volume 17– No.1, March 2011.

[13] Di Cui, Qin Zhang, Minzan Li, Glen L. Hartman, Youfu Zhao, "Image processing methods for quantitatively detecting soybean rust from multispectral images", Bio Systems Engineering, Elsevier. 107 (2010) 186-193.

[14] Kuo-Yi Huang, "Application of artificial neural network for detecting Phalaenopsis seedling diseases using color and texture features", Computers and Electronics in Agriculture 57 (2007) 3–11,Elsevier.

[15] Prof. Atul Shire, Prof. Umesh Jawarkar, Mr. Manoj Manmode, "A Review Paper On: Agricultural Plant Leaf Disease Detection Using Image Processing", IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 1, January 2015.

[16] M. Malathi, K. Aruli, S. Mohamed Nizar, A. Sagaya Selvaraj, "A Survey on Plant Leaf Disease Detection Using Image Processing Techniques", International Research Journal of Engineering and Technology (IRJET), Volume: 02 Issue: 09 | Dec-2015.

All rights reserved by *www.ijsrd.com*