International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

AN UTILIZATION OF IMAGE PROCESSING APPLICATION FOR FUNGAL DISEASE DETECTION

Prathamesh.K. Kharde[1], Mrs.Hemangi.H.Kulkarni[2]

[1,2]Dept of Electronics and Telecommunication, GES R.H Sapat College of Engineerin, Maharashtra, (India)

ABSTRACT

The grape development is an imperative constitute of Indian agrarian economy. Relevent illness control measures must be embraced grape estate to minimize losses. Creative methods using machine vision and mechanized thinking are being investigated to achieve sharp developing including early acknowledgment of contaminations in backwoods, specific fungicide application, and so forth. This examination used a texture analysis method termed the color co-occurrence method (CCM) to evaluate if grouping algorithm could be used to recognize contaminated and commonplace grape petals. Typical and unhealthy grape leaf tests were gathered and tried utilizing suitable segmentation procedure. Embedded Processor named Raspberry Pi 2 is used for these Image Processing techniques. The classification technique utilized based on Kohonen neural system classifier. This instrument can be used to recognize diverse diseases in grapevine leaves and showed the result as a sickness present on leaf close by its name and will prescribe the cures as necessities be. The algorithm is prepared on OpenCV and java as the programming language.

Keywords: Color Co-Occurrence Method, Grape Leaf Disease, Java, Kohonen Neural Network, Raspberrypi

I. INTRODUCTION

Cultivation is the life & energy of our country nation economy. Grape is most vital constitute in farming industry. Grape is typically developed for agricultural industry. Grape are usually cultivated for export to different countries. India is one of the main grape exporters in the world. India secured a ninth position on the planet among top ten grape trader nations (APEDA-2014). The noticeable assorments of grapes developed in Republic India are Thompson seedless, sonaka,Anab-e-Shahi,Perlette,Bangalore blue,Pusa Seedless, Beuty Seedless etc.The nation has transported 1,07,257.85 MT of Grapes to the world for the estimation of Rs. 1,086.51 crores amid the time 2014-15. In the grape creation Maharashtra hold the topmost position with a generation of 2292.53MT that is 81 percent share in grape production in overall country. Most of farmers are utilized conventional methods to identify any illness on plants they develop. It takes great quantity of to distinguish any contamination in the expansive field.some time disease is excessively serious, making it impossible to control which harm entire yield. Grape trees can show a substantial gathering of signs reflecting distinctive disarranges that can unfavorably influence their prosperity, life, yield, and money related efficiency. The contaminations reported in this study are regularly controlled using fungicidal specialists gave a couple

times every year to moving degrees. This procedure ordinarily requires complete vineyard scope at each treatment paying little mind to the likelihood that the forested areas is mostly influenced by the infection. Early recognizing confirmation of disease may transform into a key some portion of business grape affliction control in the future. Now and once more, sickness control exercises or recuperating measures can endeavor if the indications are perceived early. Hence to control the parasitic leaf ailments particularly Powdery mildew,Downy mildew & Black rot on grape a system is being developed.

1.1 Literature Survey

camargo and smith have reported a machine vision framework for the recognizable proof of the visual side effects of plant illnesses from hued pictures utilizing svm[1]. Manisha A. Bhange and Prof. H. A. Hingoliwala(2015) proposed a framework for improving the capability of modified normal item illness revelation by including Intent hunt system. They had done there work on pomegranate natural item having ailment bacterial blight[2].Zulkifli Bin Husin et al. (2012) proposed image processing approach for the examination of plant chili disease area. The image is firstly enhanced to keep the information after extraction then shading space is utilized to minimize the luminance. color contents is used for realization of the disease[3]. Dheeb Al Bashish et al in their paper proposed a method for digital distinguishing proof and request of plant leaf diseases with four guideline steps. In the initial step they outlined a shading change structure for the RGB leaf picture and after that utilized gadget autonomous color space change for the shading change structure.

In the second step, the Ease of use the photos were partitioned using the K means clustering process. In the third step, the texture elements for the segmented contaminated parts were figured. At last, in the fourth step the components extracted were experienced a pre-arranged neural system[4]. P.Revati et al tested development to helps the agriculturist in plant advancement process.This approach used cellphone to get polluted Cotton leaf images.RGB color highlight division is done to get infection spots.Edge recognizable procedure methodology is used for extraction of picture segments of spots to distinguish illnesses. Neural system is used to arranged the diseases. The division process is not proper for Monocot family plant.[5]

D G Kim et al., proposed a method for the portrayal of grapefruit peel contaminations in perspective of the examination of color composition highlights. The RGB pictures of grapefruits are gotten for regular and five essential weak peels.The data RGB picture is changed into discriminant examination approach i.e. they used HSI model. The 39 surface elements are isolated from changed Hue (H), Saturation (S) and Intensity (I) of the regular item locale considering the spatial gray level co-occurance matrices (SGDM) for every natural product. The discriminant segments are chosen taking into account stepwise Statistical Analysis System (SAS) STEPDISC approach. The trial is driven on 180 grapefruits, which include 30 tests from every peel condition.

The surface arrangement is performed in prospect of SAS DISCRIM capacity. The 20 tests from every peel collection are used for preparing and remaining 10 tests is utilized for testing. The best course of action precision of 96.7% results from the HSI_13 grouping model and the I_11 portrayal model yields the poor order exactness of 81.7%. The normal characterization precision of 96% is an expert for grapefruit peel ailments [6].

International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

II. PROPOSED METHOD

In the wake of reviewing diverse artistic works, obviously the endeavor of plant affliction recognizing confirmation and course of action is of more conspicuous hugeness in the field of cultivation. Therefore, making modernized techniques for plant disease portrayal has expanded much excitement for the field of examination now days. To investigate the defect an image processing system has been made to robotize the acknowledgment and order of different issue. An image processing processing based response for the customized leaf sickness revelation and request is been proposed. our answer on five sicknesses which sway on the plants; they are:Powdery mildew, Downy mildew and Black rot & non diseased (typical).To begin with, the computerized photos are acquired from the earth using a propelled camera. At that point,image processing methodologies are associated with the acquired pictures to extricate supportive segments that are central for further examination. After that, couple of logical isolating techniques are used to sort the photos as demonstrated by the specific issue close by fig.1 depicts the fundamental system of the proposed vision-based distinguishing proof figuring in this examination.

A. Description of System Methodology

- User: Clients who need to know the form of illness on grape leaf will get the photo and sent to Raspberry pi.
- Raspberry Pi:Genuine database of this work is secured in the raspberry pi with the assistance of memory card. The illness influenced leaf to be attempted is investigated with the database in the raspberry pi which gives more exact result and shows result.
- Opencv & Java based programming: The opencv platform is used utilized Java based image processing programming.
- WAP: Through network access agriculturist will send picture and structure will send the outcome to the harvester.

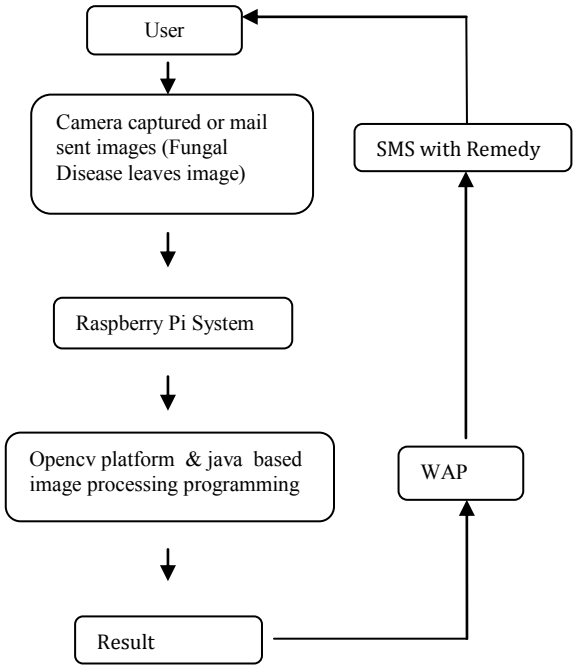


Fig1: Overview of system architecture.

International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

B. Description of Proposed Algorithm

There are two actions of the project one identified with training & other is testing stage. In training algorithm the pictures that we acquired from various sources are gone through the system. The database is made with help of mysql software.This database is used to treat the farmer in coming images.In testing stage the trained database is match with unhealthy leaf pictures coming from rancher.

a) Image Acquisition: Initially, different sick leaves are caught utilizing modern camera.

b)Pre-processing: In this stage pre-processing techniques like color transformation to HSI, Histogram & its equalization.The picture is changed over to greyscale utilizing luminosity method.It is the weighted averaging strategy. We are more responsive to green than other colours, so green is weighted most strongly.

$$P = 0.21\times R + 0.71\times G + 0.07\times B \qquad (1)$$

At that point, the picture is changed over into binary using ostu's threshold method.

c) Histogram Equalization: The pictures having poor intensity distribution can be enhanced with histogram equalization process. The objective of this procedure is to acquire uniform histogram. It enhances quality of an image**.**

d) Gaussian Filtering: Filtering technique used to boosting an image. Gaussian filter is applied for this. Gaussian filtering is two dimensional & used to blur images & abolish the noise.

$$G(x,y) = \frac{1}{2\pi\sigma^2} e^{\frac{-x^2+y^2}{2\sigma^2}} \qquad (2)$$

e) Sobel Edge Detection: Edge detection is the way of localizing pixel intensity transitions. It is a procedure of discovering sharp discontinuities in a picture... The Sobel operator is a discrete differential operant. The operator uses two 3x3 kernels: one measures the gradient in the x-direction, while the other one evaluates the gradient in the y-direction. The gradient magnitude is likely to be:

$$|G_x| = \sqrt{G_x{}^2 + G_y{}^2} \qquad (3)$$

Advantages: It is easy & It recognizes edges & their orientations.

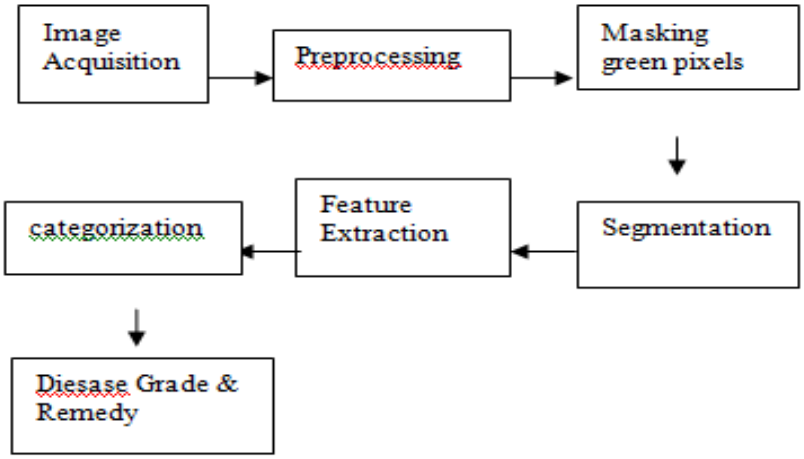


Fig2: Training algorithm

International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

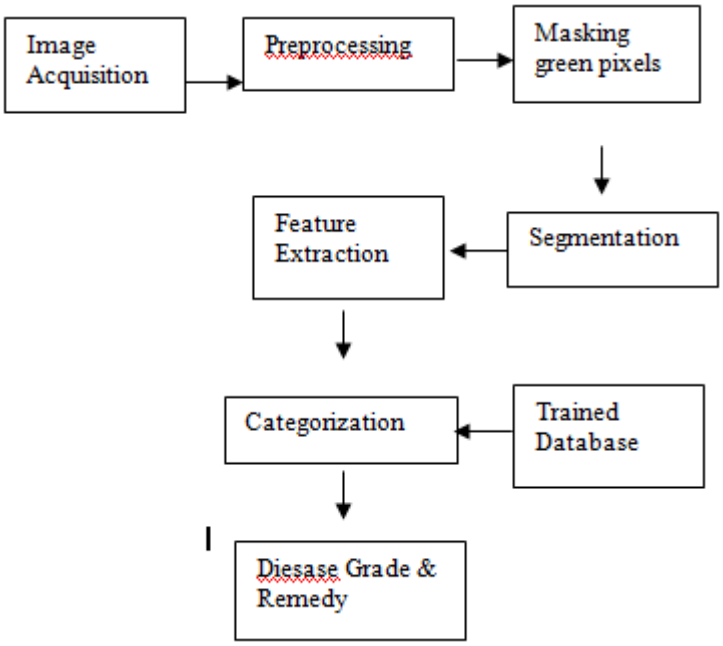


Fig3: Testing Algorithm

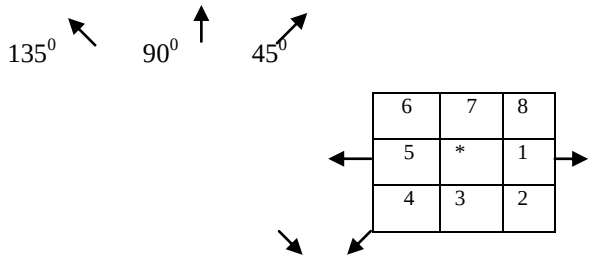
f) Segmentation: From the prior stages, tainted area of the leaf is extracted.The influenced part is then segmented into proportionate estimation of many patches. The size of the patch is picked in this kind of way that the significant information is not lost. On this portion we took patch size of 32 X 32. The following stage is to extract the valuable sections. A standout amongst the most portions incorporate rich amount of know-how. So the patches which have more prominent than half of percentage of the mastery are thought about for the additional examination. We utilized watershed segmentation system. Following are the watershed algorithm steps

- Read in the color picture & change it to grayscale.
- Use gradient magnitude as the segmentation work.
- Mark the Foreground Objects.
- Compute background Marker.
- Compute the Watershed Transform of the segmentation function.
- Visualize the outcome

g) Feature Extraction: The present execution, is to focus surface segments of the obtained undesirable portions. This is done by utilizing Gray Level Co-event Matrix (GLCM) computing. Spatial gray-level dependence matrices (SGDM's) are used to develop the color co-occurrence texture analysis method. Co-occurrence matrices measure the likelihood that pixels at one exact grey-stage will show up at a distinctive distance and orientation from any pixel when you consider that pixel has a 2nd approach other distant gray-degree. The SGDM's are spoken to by method for the perform P (i, j, d, θ) the place the gray-stage of location (x, y) in the snapshot represented by using i and j represents the gray-stage of the pixel from place (x, y) at an orientation attitude of θ, & at a distance d, the place i is the row indicator and j is the column indicator in the SGDM matrix P (i, j, d, θ). The adjacent neighbor masks, where the reference pixel (x, y) is shown as an asterisk. The one-

International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

pixel distance from the reference pixel '*'are keep up by each of the eight neighbors and they are numbered as one to eight in clockwise bearing as appeared in the figure. The neighbors at positions 1 and 5 are both inspected to be at a course point equivalent to 0^0, in the meantime areas eight and four are thought to be at an edge of 45^0[9].



After the transformation techniques, we determine the function set for H and S, we dropped (I) for the reason that it does no more give further understanding. However, we utilize GLCM perform in opencv & java to make gray-degree co-occurrence matrix; the quantity of grey stages is about to eight, and the symmetric worth is set to "real", and therefore, offset is given a "0" value.The CCM matrices are then normalized using equation (4)

$$p(i,j) = \frac{p(i,j,1,0)}{\sum_{i=0}^{N_g-1}\sum_{j=0}^{N_g-1} p(i,j,d,0)} \qquad (4)$$

P(i,j) is the image attribute matrix, p(i,j,1,0) represents the intensity co-occurrence matrix (CCM) & N_g total number of intensity levels.Various texture features is get from glcm approach.These components are given underneath

$$\text{Energy} = \sum_{i=0}^{N_g-1}\sum_{j=0}^{N_g-1} p(i,j)^2 \qquad (5)$$

$$\text{Entropy} = \sum_{i=0}^{N_g-1}\sum_{j=0}^{N_g-1} p(i,j)\ log\ p(i,j) \qquad (6)$$

$$\text{Correlation} = \frac{\sum_{i=0}^{N_g-1}\sum_{j=0}^{N_g-1}(i,j)p(i,j)-\mu_x\mu_y}{\sigma_x\sigma_y} \qquad (7)$$

h) Kohonen Neural Network: Artificial Neural Network has been a driving innovation for training & ordering. In this paper, neural frameworks are used as a part of the programmed revelation of leaves afflictions. Neural network is picked as a classification instrument mechanism because of its all around perceived strategy as a productive classifier for a considerable measure of genuine applications. The preparation and affirming approaches are among the numerous principle ventures in setting up a right procedure model making utilization of Neural strategies. The dataset for preparing and endorsement shapes involves two areas; the practice set which are utilized to prepare the neural network model; while a testing highlights sets are utilized to affirm the precision of the arranged neural system model. Teuvo Kohonen was the originator of this sort of self-organising network. The point of a Kohonen network is to supply a pattern classifier, that is self-organizing and utilizes a type of unsupervised learning to manage the weights. Typically,a Kohonen network contains of a two-dimensional array of neurons with the most of the inputs touching base at all of the neurons.The system is made out of a lone layer of neurons, composed into a consistent grid. Each of these neurons has a weight vector, indistinguishable in dimension to inputs of the system and instated with irregular qualities. The system employs the "winner-takes- all action: upon showing of an input vector, the neuron with weight vector nearest to the

International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

input (the supposed winner or representing for this input) is initiated, while the movement of all the other neurons is suppressed.

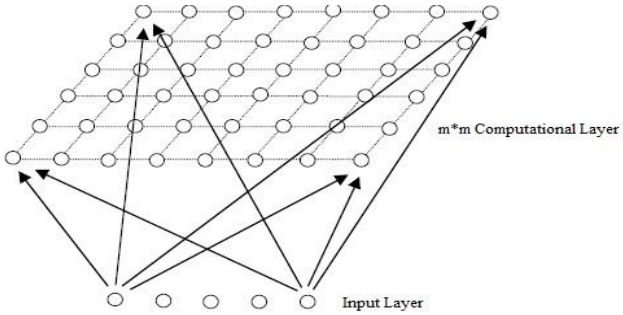


Fig4: Kohonen Neural Network

Kohonen neural network is used to train the images.The count of neurons in the in the info layer compares to the amount of information elements and the quantity of neurons in the yield layer identifies with the amount of classes. The phases of the SOM algorithm is summarized as **Initialization:** Choose random values for the initial weight vector w_j.

Sampling: Draw a sample training input vector x from the input space.

Matching: Find the winning neuron I(x) with weight vector nearest to input vector.

Updating: Apply the weight update equation

$$\Delta w_{ij}=\Pi(t)T_{j,I(x)}(t)(x_i-w_{ji}).$$

Continuation: Back to stage 2 till the feature map stops changing.

i) Programming Environment & Language: Open CV is an open source computer vision library. The library is composed in C and C++ and runs under Linux, Windows and Mac OS X. There is alive progress on interfaces for Python, Ruby, Java, Matlab, and other languages. Open CV was advised for computational capacity and with a able spotlight on real time Applications. Here we use java for programming the code for image processing.

III. RESULT

We are tested four types of the leaves like Powdery mildew, Downy mildew, Black rot & typical. The educating (training)& testing result are shown. Each of illness leaves 50 samples are taken for training. Above 40 images are tested. The percentage accuracy of 93.44 is achieved.

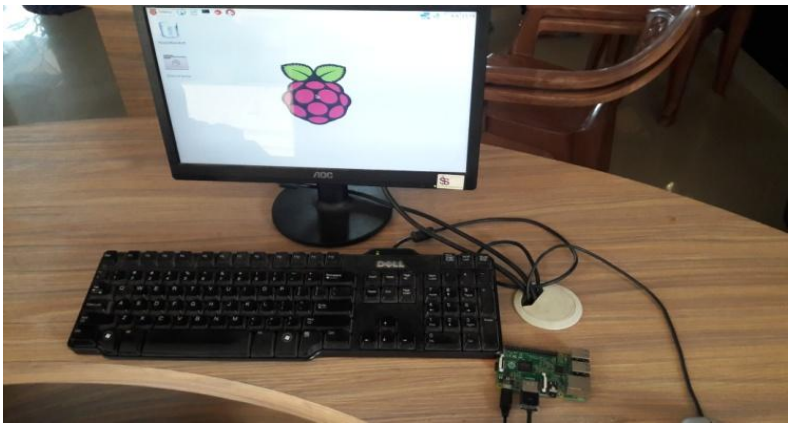
International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

TABLE I

The Result Table

Disease Type	Training	Testing	Not detected	Percentage % Accuracy
Powdery Mildew	50	42	3	92.85
Downy Mildew	50	42	4	90.47
Black Rot	50	42	2	95.23
Normal	50	42	2	95.23
Overall percentage				93.44

3.1 Experimental Setup:



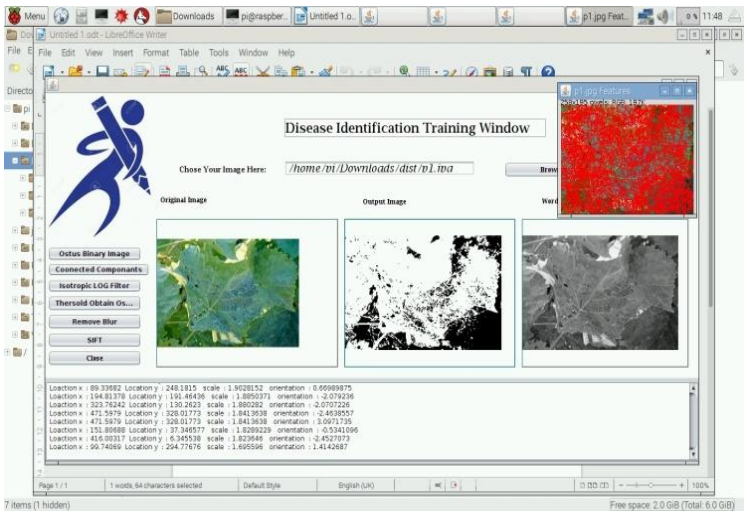
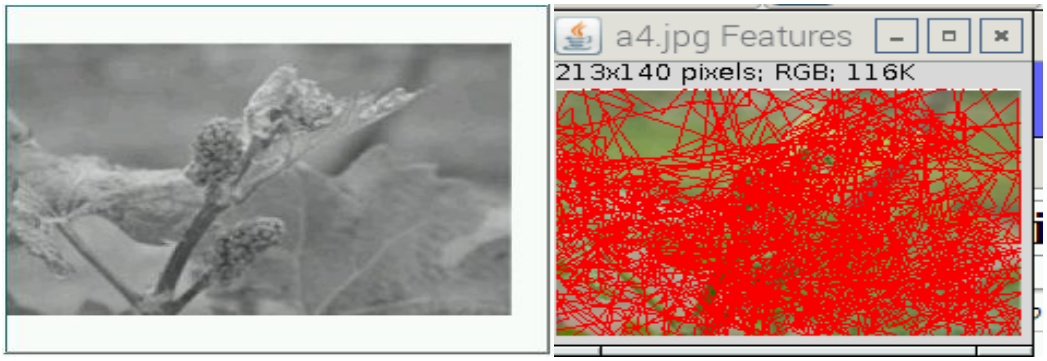


Fig5: Training Result

International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

(a) Powdery mildew **(b) segmented image**



(c) grayscale image affected leave **(d)Feature extracted image**

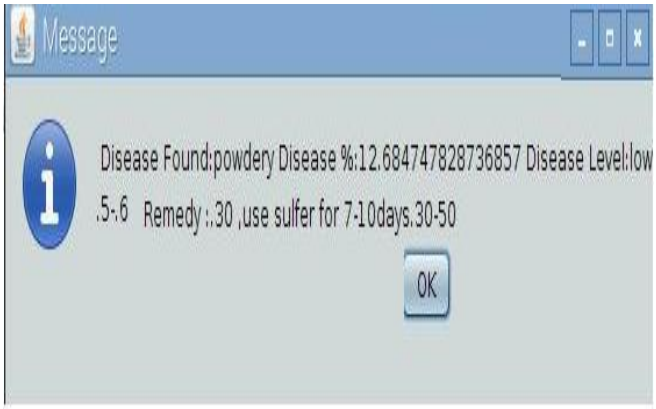


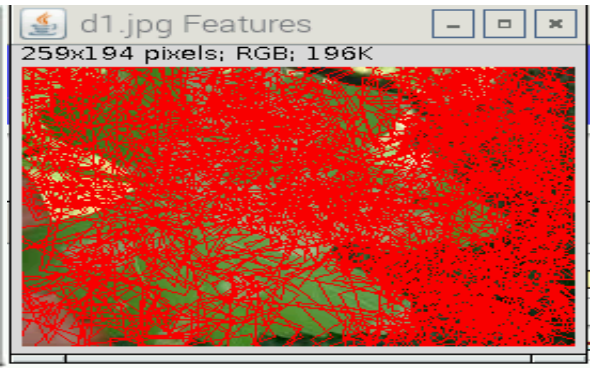
Fig.6. Result of Powdery mildew disease detected

International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045

(a) Downy mildew

(b) segmented image

(c) Grayscale image



(d)Feature extracted image affected leave

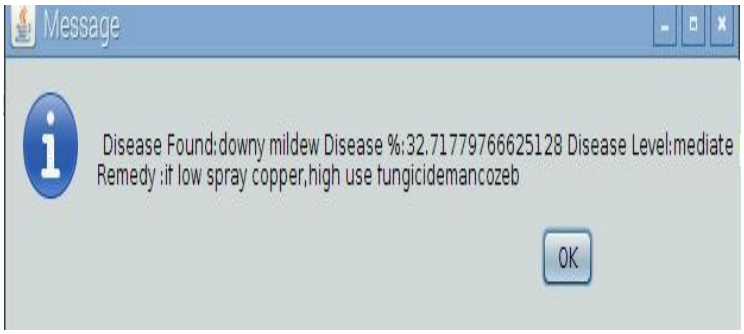
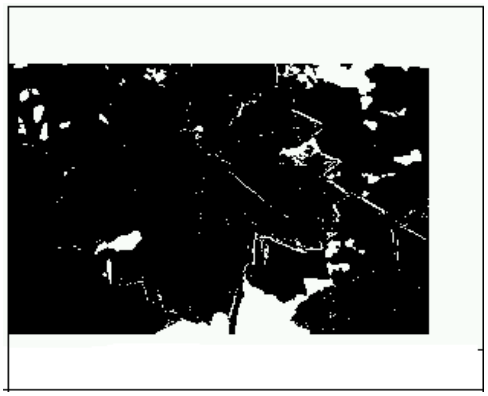


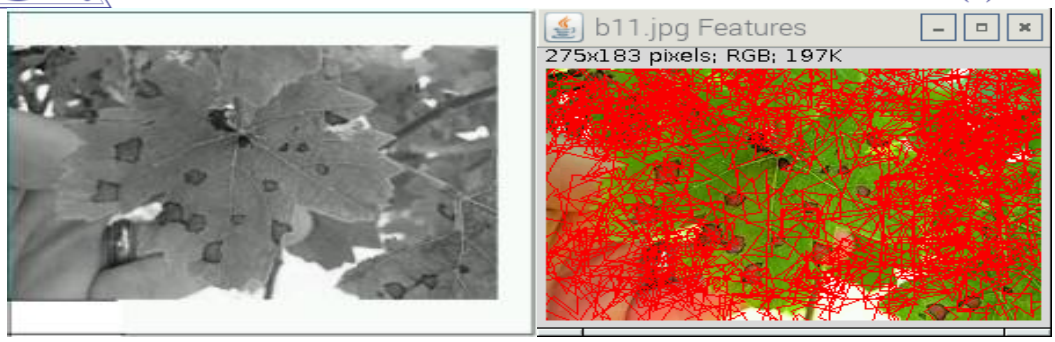
Fig.7. Result of Downy mildew disease detected

(a) Black Rot affected image



(b) segmented image

International Journal of Electrical and Electronics Engineers
Vol. No. 8, Issue No. 02, July-December 2016
ISSN (O) 2321-2055
ISSN (P) 2321-2045



(C) Grayscale Image **(D) Feature Extracted Image**

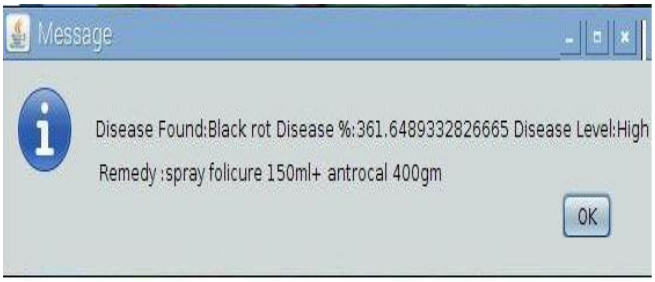


Fig.8. Result of Black Rot disease detected

IV. CONCLUSION

The photos of grape leaf are taken care of and in case it is debased by any ailment then the system perceives the affliction. Kohonen neural system is used for describing disease on grape leaves as demonstrated by their segments. General precision of 93.44 has been found with this strategy.

V. ACKNOWLEDGMENT

The authors are thankful to Prof. S.P Agnihotri, Head of the Department (Electronics and Telecommunication), Prof. M. P. Joshi ME coordinator. Dr. P. C. Kulkarni, Principal, Mr. P. M. Deshpande, Project Director, Sir M. S. Gosavi, Director, G.E.S. R.H .Sapat College of Engineering, Management Studies and Research Nashik, Maharashtra, India.

REFERENCES

[1] Camargo-Rodriguez , A V & Smith , J S 2009 , ' An image-processing based algorithm to automatically identify plant disease visual symptoms ' Biosystems Engineering , vol 102 , no. 1 , pp. 9 - 21 . , 10.1016/j.biosystemseng.2008.09.030.

[2] Bhange M., Hingoliwalab H. “Smart farming : Pomegranate Disease Detection Using Image Processing ,” Proceddings of ELSEVIER, Second international symposium on computer vision and the internet (vision Net 15),pp. 280 –288, 2015

[3] Husin, Z.B.; Shaka A.Y.B.M.; Aziz, A.H.B.A.; Farook R.B.S.M., "Feasibility Study on Plant Chili Disease Detection Using Image Processing Techniques," in Intelligent Systems, Modelling and Simulation (ISMS), 2012 Third International Conference on , vol., no., pp.291-296, 8-10 Feb. 2012

[4] Bashish D., M. Braik and S. Bani-Ahmad, "Detection and classification of leaf diseases using K-means-base segmentation and neural networks based classification."Inform.Technol.J.,10:267-275. DOI:10.3923/itj.2011.267.275, January, 2011.

[5] Revathi P., Hemalatha M., "Advance computing enrichment evaluation of cotton leaf spot disease detection using Image Edge detection, 2012 Third International Conference on Computing Communication & NetworkingTechnologies (ICCCNT) pp.1-5, 26-28 July2012

[6] DaeGwan Kim, Jianwei Qin ,Thomas F. Burks, 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.

[7] Muhammad Hameed Siddiqi, SuziahSulaiman, Ibrahima Faye and Irshad Ahmad, "A Real Time Specific Weed Discrimination System Using Multi-Level Wavelet Decomposition," International Journal of Agriculture & Biology, ISSN Print: 15608530; ISSN Online: 1814- 9596.

[8] Sabine D. Bauer, FilipKorc, Wolfgang Forstner, "The Potential of Automatic Methods of Classification to identify Leaf diseases from Multispectral images," Published online: 26 January 2011, Springer Science+Business Media, LLC 2011, Precision Agric, DOI 10.1007/s11119-011-9217-6

[9] H. Al-Hiary, S. Bani-Ah Mad, M. Reyalat, M. Braik and Z. A L rahamneh, "Fast and Accurate Detection and Classification of Plant Diseases", IJCA, 2011, 17(1), 31-38, IEEE-2010.

[10] Bashir, S. and N. Sharma, 2012. "Remote Area Plant Disease Detection Using Image Processing," (CiSE). Journal of Electronics and Communication Engineering, 2: 31-34.

[11] Wayne F. Wilcox, Grape disease control2013 Department of Plant Pathology, Cornell University, NY State Agricultural Experiment Station, Geneva NY 14456

[12] A. Meunkaewjinda, P. Kumsawat, K. Attakitmongcol, and A. Srikaew, "Grape leaf disease detection from color imagery using hybrid intelligent system", in Proceedings of the 5th International Conference on Electrical Engineering/Electronics Computer, Telecommunications and Information Technology (ECTI-CON '08, IEEE, May 2008,), pp. 513-516

[13] S. S. Sannakki, V. S. Rajpurohit, V. B. Nargund and P. Kulkarni, "Diagnosis and classification of grape leaf diseases using neural networks",*Computing,Communications and Networking Technologies(ICCCNT),2013 Fourth International Conference on*,Tiruchengode,2013,pp.1-5.doi: 10.1109/ICCCNT.2013.6726616

[14] Gonzalez, R. C. and Woods, R. E. [2008]. Digital Image Processing, 3rd ed., Prentice Hall, Upper Saddle River, NJ.