Plant Disease Monitoring System

[1]Shubham kini, [2]Sneha Bhagade, [3]Vighnesh Gawad, [4]Tushar Chaudhari

[1,2,3]UG Student, [4]Professor, [1,2,3,4]Department of Electronics and Telecommunication SJCEM, Palghar, India.

[1]shubham.kini21@gmail.com, [2]sneha2bhagade@gmail.com, [3]gawadvighnesh@gmail.com, [4]tusharc@sjcet.co.in

Abstract: - Recognition of plant diseases is an important key for preventing losses in agriculture. A diseased plant does effect on quality and quantity of the agricultural product. It is not so easy to monitor the plant diseases by manual methods. Using image processing method makes it easier for the detection of plant diseases. As increasing growth and producibility of the agriculture field, farmers need automatic monitoring of disease of plants instead of physical methods. The proposed system is regarding automatic detection of diseases; as the plant is exposed to the attacks from various micro-organisms and bacterial diseases and pests. A robot will be present to capture the image. The robot will continuously capture the images of plants and will send the captured images to a user's computer in which with the help of image processing it will be very easy to detect the disease in plants.

Keywords —MATLAB, clustering, segmentation, enhancement, SVM algorithm, GUI, Raspberry pi

I. INTRODUCTION

In countries like India, the economy mainly depends on agriculture. Due to plant diseases, the quality and quantity of agriculture product are reduced. Plant disease detection and treatment is very important in an earlier stage to cure and control the disease. Automatic detection of plant diseases is necessary to detect the symptoms of diseases in before stages when they appear on the growing leaf and fruit of a plant.

Chili is included as the example of a plant. There are two types of factors which can lead to death and destruction to chili plants; biotic and abiotic agents. Main symptoms are colour distortion, stunted growth, ruined pods. Although pests & diseases can cause considerable yield losses or directly affect human health. [3] However, crop losses can be decreased, and specific treatments could be done if plant diseases are correctly detected and recognized early. The proposed system is regarding automatic detection of diseases; as the plant is exposed to the attacks from various micro-organisms and bacterial diseases and pests.

The symptoms of the diseased plants are usually distinguished through the leaves, stems or fruit Inspection. The proposed system will be used to perform in a wide range of plants area. Diagnosis involves steps like image acquisition, image pre-processing, image segmentation, feature extraction, and classification. Leaf image is captured and processed to work out the health standing of every plant.

II. PROBLEM OF STATEMENT

The purpose of this project is to design a prototype for real-time health monitoring of the plants. As 60-70% of India

the chili plant leaf image and processed to determine the health status of the chili plant. Their technique is ensuring that the chemicals should apply to the diseased chili plant only. They used the MATLAB for the feature extraction and image recognition. In this paper pre-processing is done using the Fourier filtering, edge detection, and morphological operations. Computer vision extends the image processing paradigm for object classification. Here the digital camera is used for the image capturing and LABVIEW software tool to build the GUI.

III. PROPOSED SYSTEM

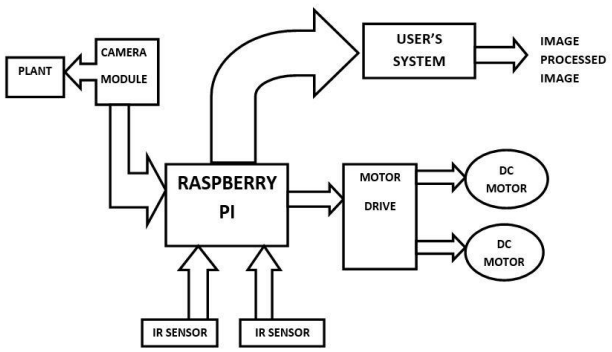


Fig: - Basic block diagram of proposed system

 DOI : 10.18231/2454-9150.2019.0247

The proposed system is regarding automatic detection of diseases; as the plant is exposed to the attacks from various micro-organisms and bacterial diseases and pests. A robot will be present to capture the image. A robot will continuously capture the images of plants and will send the captured images to the user's computer in which with the help of image processing it will be very easy to detect the disease in plants. The symptoms of the attacks square measure typically distinguished through the leaves stems or fruit Inspection. The proposed system will be used to perform in a wide range of plants area. Disease detection involves steps like image acquisition, image pre-processing, image segmentation, feature extraction, and classification. The disease detection through leaf image and processing techniques is extremely helpful and cheap system particularly for helping farmers in observation the large plantation space. Leaf image is captured and processed to work out the health status of every plant.

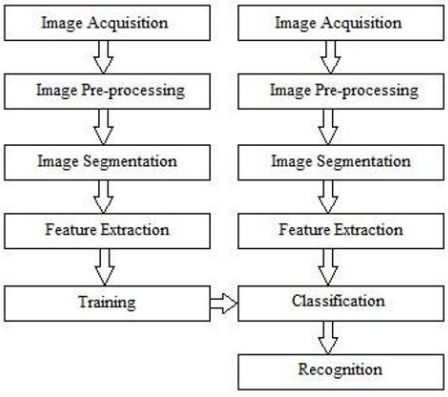


Fig: - Flow of image detection and classification

A] Image Acquisition

The images of the plant leaf area unit captured through the camera. This image is in RGB (Red, Green and Blue) color transformation structure, and then a device-independent color space transformation for the color transformation structure is applied [5].

B] Image Pre-processing

To remove noise in an image or another object removal, different pre-processing techniques is considered. Image clipping i.e. Cropping of the leaf image to induce the interested image region. Image smoothing is done using the smoothing filter. Image improvement is applied for increasing the contrast.

The RGB images into the grey images using color conversion using equation (1). f(x)=0.2989*R + 0.5870*G + 0.114.*B - -- (1) Then the histogram leveling that distributes the intensities of the images is applied on the image to boost the plant disease pictures. The accumulative distribution operate is employed to distribute intensity values [2].

Fig: - Image pre-processing (Edge Detection Method)

C] Image Segmentation

Segmentation suggests that partitioning of an image into numerous a part of same features or having some similarity. The segmentation will be done using numerous strategies like Otsu's methodology, k-means clustering, converting the RGB image into HIS model etc.

- Segmentation exploitation Boundary and spot detection algorithm: The RGB image is regenerate into the HIS model for segmenting. Boundary detection and spot detection helps to find the infected part of the leaf as discussed in [4]. For boundary detection, the 8 connectivity of pixels is considered, and a boundary detection algorithm is applied [4].

- K-means clustering:

The K-means clustering is used for classification of an object based on a set of features into K number of classes. The classification of an object is done by minimizing the sum of the squares of the distance between the object and the corresponding cluster.

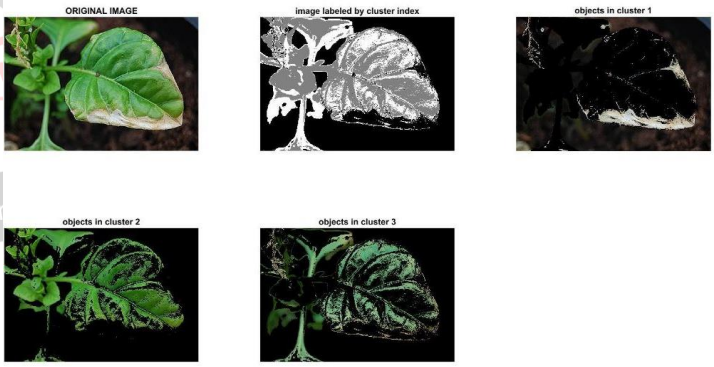


Fig: - clustering of plants leaf

K means ALGORITHM: -

- Step 1: Read Image
- Step 2: Convert Image from RGB Color Space to L*a*b* Color Space
- Step 3: Classify the Colors in 'a*b*' Space Using K-Means Clustering
- Step 4: Label Every Pixel in the Image Using the Results from KMEANS
- Step 5: Create Images that Segment the H&E Image by Color.
- Step 6: Segment the Nuclei into a Separate Image

D] Feature Extraction

 DOI : 10.18231/2454-9150.2019.0247

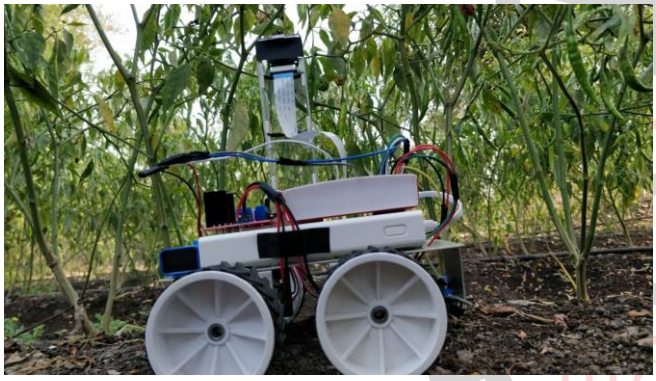
Feature extraction plays an important role in the identification of an object. In many applications of image processing, feature extraction is used. Color, texture, morphology, edges etc. are the features which might be utilized in disease detection.

In paper [2], Monica jhuria et al considers color, texture, and morphology as a feature for disease detection. They have found that the morphological result gives a better result than the other features. Texture suggests that however the color is distributed within the image, the roughness, hardness of the image. It also can be used for the detection of infected plant areas.

IV. RESULT

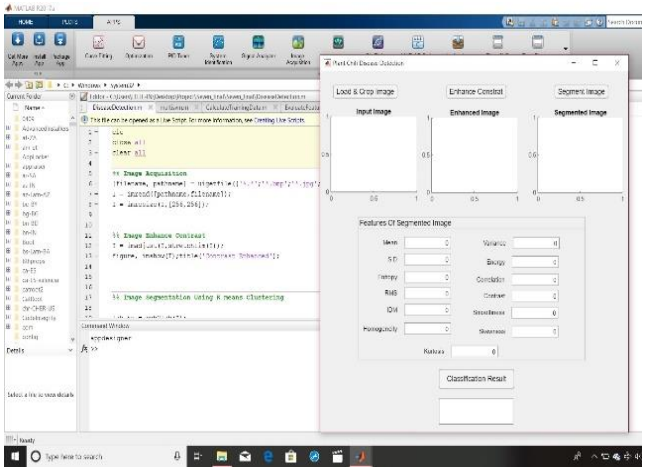
A robot will be present in the farm field. This robot will pass through all the farm field. With the help of the IR sensor, the robot will travel over the field.

As the camera is present on the top of the robot, this raspberry pi camera module will continuously capture the images and will send to the server.

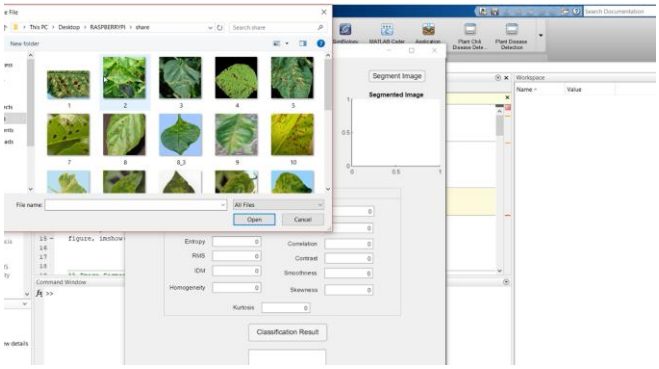


A robot will continuously capture the images, and these images will be directly get stored in the folder which will be automatically created with the provided program. as directly capturing the image number wise store the images on the folder.

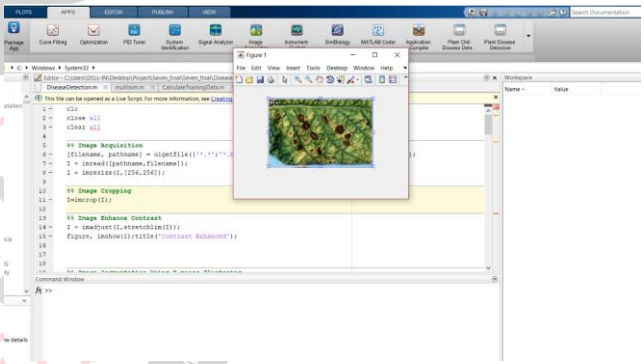
Then we have to go through MATLAB for software functions.



We must load the image first from the folder. There are so many pictures should be there in folder which are captured during the process of monitoring. Some images can be blur or some images can be not useful for purpose of monitoring. so, there is an option of selecting the image and load it into application.

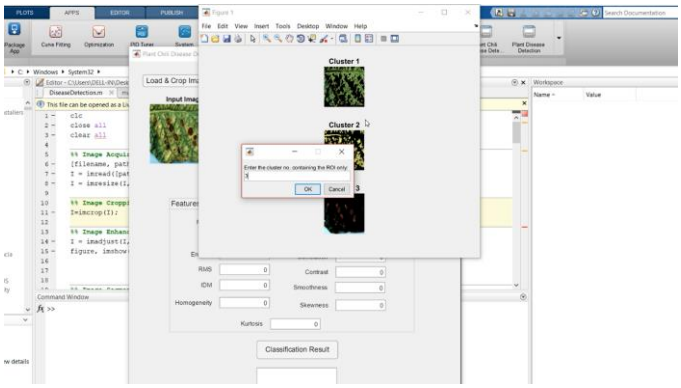


since it is real time capturing of the images, there are chances of images to be get blur, or there are chances that some pictures are not useful. so, we have given a option of cropping the image, so that we can use the specific portion of the image which will help for detecting the image.



Then there is an option of enhancing the contrast, with use of this option we can blur the avoid the unwanted portion and focus will only on characteristics of the image.

Then image will get segmented, in that 3 clusters of images will be created. out of the 3 clusters we must select any one cluster which is showing whole image as black and if any disease is present it will show by different colors. we must select that cluster image.



Then image is segmented using K-means clustering algorithm and 3 clusters of that image are created. We have to choose the proper cluster image. Then after that code will

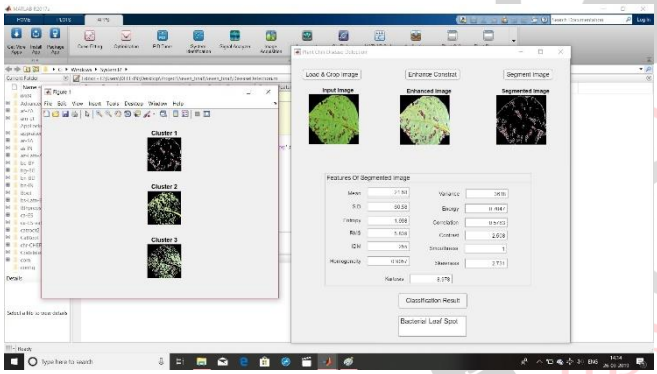
 DOI : 10.18231/2454-9150.2019.0247

calculated features of segmented image. We calculate following features Mean, variance, standard deviation, energy, entropy, correlation. RMS, contrast, Inverse difference movement, smoothness, homogeneity, skewness, kurtosis.

Disease Name	Energy	Entropy	Correlation	Homogeneity	IDM	Mean	Variance	SD	Smoothness	Skewness	Contrast	Kurtosis
Bacterial Leaf spot	0.72	1.90	0.549	0.91	255	19.66	3345	58.16	1	2.93	2.45	10.1
	0.74	1.64	0.73	0.96	255	14.69	1812	46.13	1	3.75	0.80	17.38
	0.68	2.39	0.72	0.92	255	23.8	3460	60.04	1	2.48	1.57	7.89
Moises	0.61	2.09	0.85	0.91	255	25.68	2501	58.96	1	2.21	0.90	6.64
	0.41	3.58	0.93	0.94	255	32.98	1952	50.74	1	1.23	0.30	3.03
	0.26	4.74	0.91	0.90	255	45.68	2242	54.19	1	0.69	0.41	1.96
Healthy	0.11	6.79	0.92	0.88	255	104.7	3864	67.86	1	0.22	0.52	2.16
	0.24	5.53	0.94	0.92	255	80.48	4318	78.13	1	0.23	0.51	1.503
	0.29	4.58	0.95	0.92	255	93.9	8349	101.6	1	0.27	0.77	1.207

Fig: -Feature Extraction

Then we will Classify the result using multi SVM algorithm. If image is Healthy it will show as HEALTHY otherwise it will display the name of disease.



V. CONCLUSION AND FUTURE SCOPE

We have created a system with the help of Raspberry pie. The robot will pass through farm and it will continuously capture the images. This image will directly be transmitted to the server. On server system MATLAB application is present in which classification of image will be done. It can be extended to suggest the suitable pesticides for disease. This will be time saving and automated system in the field of agriculture. Farmer can monitor the health of plants even though he is far away from the field.

This is just a prototype of project we can make a robot in large scale. Also, we can add pesticides which can be used for preventing the disease.

An adjustable camera can be added for better resolution of images which are captured by robot.

REFERENCES

[1] Wenjiang Huang, Qingsong Guan, Juhua Luo, Jingcheng Zhang, Jinling Zhao, Dong Liang, Linsheng Huang, and Dongyan Zhang, "New Optimized Spectral Indices for Identifying and Monitoring Winter Wheat Diseases", IEEE journal of selected topics in applied earth observation and remote sensing,Vol. 7, No. 6, June 2014

[2] Monica Jhuria, Ashwani Kumar, and Rushikesh Borse, "Image Processing For Smart Farming: Detection Of Disease And Fruit Grading", Proceedings of the 2013 IEEE Second International Conference on Image Information Processing (ICIIP-2013)

[3] Zulkifli Bin Husin, Abdul Hallis Bin Abdul Aziz, Ali Yeon Bin Md Shakaff Rohani Binti S Mohamed Farook, "Feasibility Study on Plant Chili Disease Detection Using Image Processing Techniques", 2012 Third International Conference on Intelligent Systems Modelling and Simulation

[4] Sachin D. Khirade, A. B. Patil, "Plant Disease Detection Using Image Processing" IEEE International Conference on Computing Communication Control and Automation, pp. 978-1-4799-6892-3/15, 2015.

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

[6] Santanu Phadikar and Jaya Sil "Rice Disease identification using Pattern Recognition Techniques" IEEE Proceedings of 11th International Conference on Computer and Information Technology (ICCIT 2008), Khulna, Bangladesh, pp. 1-4244-2136-7/08, 25-27 December, 2008. J. G. Kreifeldt, "An analysis of surface-detected EMG as an amplitude-modulated noise," presented at the 1989 Int. Conf. Medicine and Biological Engineering, Chicago, IL.

[7] Ms. Kiran R. Gavhale, Prof. Ujwalla Gawande and Mr. Kamal O. Hajari "Unhealthy Region of Citrus Leaf Detection Using Image Processing Techniques" IEEE International Conference for Convergence of Technology, pp. 978-1-4799-3759-2/14, 2014.

[8] Sabah Bashir and Navdeep Sharma "Remote Area Plant Disease Detection Using Image Processing" IOSR Journal of Electronics and Communication Engineering (IOSRJECE) ISSN: 2278-2834 Volume 2, Issue 6, PP 31-34, Sep-Oct 2012.

[9] Ms. Kiran R. Gavhale, Prof. Ujwalla Gawande and Mr. Kamal O. Hajari "Unhealthy Region of Citrus Leaf Detection Using Image Processing Techniques" IEEE International Conference for Convergence of Technology, pp. 978-1-4799-3759-2/14, 2014.

[10] Murali Krishnan and Dr.M.G.Sumithra "A Novel Algorithm for Detecting Bacterial Leaf Scorch (BLS) of Shade Trees Using Image Processing" IEEE 11th Malaysia International Conference on Communications, Kuala Lumpur, Malaysia pp. 978-1-4799-1532-3/13, 26th - 28th November 2013.

 DOI : 10.18231/2454-9150.2019.0247