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Automatic Detection and Classification of Pomegranate Disease using Image Processing

Ranjit Bharane[1]andSwatiKadlag and Dr.Narayan Pisharoty

Department of Electronics & Telecommunication Engineering, Symbiosis International UniversityPune, Maharashtra
ranjit.bharane@sitpune.edu.in

ABSTRACT:
In India, lakhs of farmers perform pomegranate farming.As surveyed in Maharashtra, we found two diseases very effective on pomegranate. These two diseasesare named asPunicagranatum and Bacterial blight. These diseases are very harmful and it is very hard to control their spread. These diseases are increasing very rapidly. One disease affects the fruit in summer season and otherin rainy seasons.
So these diseases are controlling by using lot of water and medicines. That is why 50% fruits are damages because of chemical affected. We are developing new module this module work in different stages. Fast one is the module connecting in between tractor and water tank, camera connecting in front of tractor camera tack the video. Then found video duration, number of frame, size of frame, width of frame. Each frame comes to images processing part. Time delay between two frames is 0.033 seconds.This pixel is come in images processing block. This processing part is found which disease present or not and how much affecting area is present and which part is affected.
Next part, image processing part is given the disease name and affecting part and this signal given next port. Two relay connecting to processing system. Whichdisease is present according to relay on or off If disease one is present then fast valve open. If disease second is present then second valve open else off both the valvesand spay the particular in particular disease solution. This project is saving lakhs of water and medicine.

KEYWORDS: Disease detection, image acquisition, segmentation and image processing, Canny's edge detection algorithm

1. INTRODUCTION

India is an agricultural country wheremost of the population depends on agriculture. Research in agriculture is aimed towards increase of productivity and food quality at reduced expenditure, to increase the profit and to complete high demand of the market because of limited Fruits supply. Many studies showthat quality of agricultural productivity may be reduced due to plant diseases. Business of grape, pomegranate, Tomato indeed belongs in the high-risk plants. Therefore, strategies and technical knowledge and the field became an important matter to be mastered. The systematic structure should be developing so that it will be used by operators to increase the overall production. Many farmers refused to cultivate pomegranate in the rainy season due to the increase of pomegranate disease to become high risk for the quality control and productivity and also in summer season disease highly effects to fruits.
The objective of this proposal is to concentrate on the pomegranate disease detection. This proposal is organized into the following parts. Part 1 gives an introductory part includes importance of pomegranate fruit disease detection, pomegranate analysis, various types of pomegranate diseases and its symptoms. Part 2 presents a detailed discussion on recent work carried out in this area. Part 3 includes basic methodology for pomegranate disease detection which represents a brief review on various image processing techniques. Finally part 4 is Develop different module to use prestige pump for spray the medicine on particular plant where it will require.In this proposal less solution is required compared to other technologies. In this technologycamera is used for taking videos, next step is generating the frames, applying image processing part to each frames and theTime delay between two frames is 0.033 seconds andif any disease found then the next step will be to check which type of disease is present, if first disease is found then switch on first valve, if second disease found then switch on second valve. These valves are connected to particular solution tanks in particular disease. This technology is saves water and medicine and reduces chemical effect of plant also Improves the quality of fruits. This proposal provides a wide survey carried out to study advances in different image processing techniques used for studding plant diseases/traits & prestige technology.

1.1. Plant diseases analysis

The RGB image feature pixel counting techniques is extensively applied to agricultural science. Image analysis can be applied for the following purposes:
1. To detect pomegranate fruit diseases.
2. To quantify affected area by disease.
3. To find the boundaries of the affected area.
4. To determine the color of the affected area
5. To determine size & shape of fruits.

1.2.Punicagranatum disease symptoms

The disease is characterized by total black fruits. Which soon come into view as water-soaked fruit.Initially the color converts purple to black increasing effect of fruits after some day total fruit becomes black and it stops the growth of fruit and after 15 days fruit gets weak and separated from the branch of the plant.

Season
Rainy, high humidity

Chemical:

- Spraying Mancozeb (0.25%) or Captaf (0.25%) effectively controls the disease.

1.3. Bacterial blight disease symptoms

Bacteria blight on young and developing pomegranate. Initially spot are black and round and surrounded by bacterial zone. After same day this spot raised and crack the fruits. The disease may causes up to 90% yield reduction.

Season
High temperatures and low humidity.

Chemical:

- Spraying 1 g $ZnSo_4$ +1 g $MgSo_4$ +1 g Boron +1g $CaSo_4$ per lit of water.

2. LITERATURE REVIEW & RELATED WORK

Jayamala K. Patil, Raj Kumar [1] in this paper had approach histogram and color image segmentation technique to exact intensity pattern to disease accordingly it is then possible to analyze the different flower diseases.

KanjiAleya, DebabrataSamanta [2] this histogram is matching-color feature and the edge detection technique. To generate the samples by using layers separation technique which separate the layers of RGB image and edge detection technique which detecting edges of the layered images. It compare testing sample with the diseased sample and these steps take few minute to display the comparison result that is the testing sample is diseased or not.

Ms.KiranGavhale, Prof.UjwallaGawande[3]the major techniques for detection of plant diseases are: BPN, SVM, and SGDM. These techniques are used to analyses the healthy and diseased plants eaves. These techniques viz. effect of background data in the resulting image, optimization of the technique for a specific plant leaf diseases, and automation of the technique for continuous automated monitoring of plant leaf diseases under real world field conditions. The review suggests that this disease detection technique.

Vinita Tajane, Prof. N.J. Janwe [4] in this paper compare testing sample with the diseased sample and these steps will take few minute to display the comparison result on the basis of mean median values of image histogram and Display which type of disease. The work assists human beings in classification of medicinal plants in the real world and considered an essential task in pharmaceutical industry, Ayurvedic practitioners and botanists.

PiyushChaudhary, Anand K. Chaudhari, Dr.A.N.Cheerana, ShardaGodara[5]This paper they work no YCbCr, HSI and CIELAB color models. All these color models are compared and finally 'A' component of CIELAB color model is used. Color transformed image is passed through median filter. In last, disease spots are segmented by applying OTSU threshold on 'A' component of LAB colorspace. They shows that noise which is introduced because of background, vein and camera flash; can be wiped out using CIELAB color model this method different disease spots are detected accurately and results are not affected by background, type of leaf, type of disease spot and camera.

G.T. Shrivakshan, Dr.C. Chandrasekar, [6]the edge detection is the primary step in identifying an image in this paper we dealt with study of edge detection techniques of Gradient-based and Laplacian based. A novel edge-detection algorithm is necessary to provide an errorless solution that is adaptable to the different noise levels of these images to help in identifying the valid image contents produced by noise. The performance of the canny algorithm relies mainly on the changing parameters which are standard deviation for the Gaussian filter, and its threshold values. The size of the Gaussian filter is controlled by the greater value and the larger size. The larger size produces more noise, which is necessary for noisy images, as well as detecting larger edges. We have lesser accuracy of the localization of the edge then the larger scale of the Gaussian. Canny's edge detection algorithm is more costly in comparing to Sobel, Prewitt and Robert's operator. Even though, the Canny's edge detection algorithm has a better performance. The evaluation of the images showed that under the noisy conditions, Canny, LoG, Sobel, Prewitt, Roberts's are exhibited better performance, respectively. The various methodologies of using edge detection techniques namely the Gradient and Laplacian transformation. It seems that although Laplacian does the better for some features.

3.PROPOSED METHODOLOGY

In this proposalGradient-based and Laplacian based areused for edge detection and color detection techniques. Because a novel edge-detection algorithm is necessary to provide an errorless solution that is adaptable to the different noise levels of these images to help in identifying the valid image contents produced by noise. The performance of the canny algorithm relies mainly on the changing parameters which are standard deviation for the Gaussian filter, and its threshold values. The size of the Gaussian filter is controlled by the greater value and the larger size. The larger size produces more noise, which is necessary for noisy images, as well as detecting larger edges. We have lesser accuracy of the localization of the edge than the larger scale of the Gaussian. Canny's edge detection algorithm is more costly in comparing to Sobel, Prewitt and Robert's operator. Even though, the Canny's edge detection algorithm has a better performance. The evaluation of the images showed that under the noisy conditions, Canny, LoG, Sobel, Prewitt, Roberts's are exhibited better performance, respectively. The various methodologies of using edge detection techniques namely the Gradient and Laplacian transformation. It seems that although Laplacian does the better for some features.

In this proposal use YCbCr, HSI and CIELAB color models. All these color models are compared and finally 'A' component of CIELAB color model is used. Color transformed image is passed through median filter. In last, disease spots are segmented by applying threshold on 'A' component of LAB color space. Shows that noise which is introduced because of background, vein and camera flash; can be wiped out using CIELAB color model this method different disease spots are

detected accurately and results are not affected by background, type of fruit, type of disease spot and camera.
In this proposal Sprinkler valve module is used to spray medicines in particular plant in this method. Here the two tanks are carried out for two different solutions. If camera found any one disease one of them then controller call to particular switch this switch open for particular time to spray the medicines.This piston moves by using tractor for this proposal andnot using any types of motor because this module connected to tractor and tractoris moving on all overthe farm and this module automatically work or find disease and gives solution

3.1. Thresholding
During the Thresholding process, in an image there are number of individual pixels and which is marked as object pixels. It has same value and if it is greater than same threshold value we assume an object to be brighter than the background. Typically, value of "1" is assigned to object pixel. While value is "0" is assigned to background pixel. The key parameter in the thresholding process is the choice of the threshold value.

3.2. RGB component
The color systems used by scientists and artists are entirely different. An artist will mix blue and red, green;a scientist will mix green and red light to create yellow. If we got image in to camera but this image is RGB but we want to work only pomegranate fruit. So we are givingredcomponent threshold, green and blue component is zero. That is why only red component is present and other component is block.

3.3. Median filter
The median filter is normally used to reduce noise in an image, somewhat like the meanfilter. However, it often does a better job than the mean filter of preserving useful detail in the image. The median filter considers each pixel in the image in turn and looks at its nearby neighbors to decide whether or not it is representative of its surroundings. Instead of simply replacing the pixel value with the mean of neighboring pixel values, it replaces it with the median of those values. The median is calculated by first sorting all the pixel values from the surrounding neighborhood into numerical order and then replacing the pixel being considered with the middle pixel value.

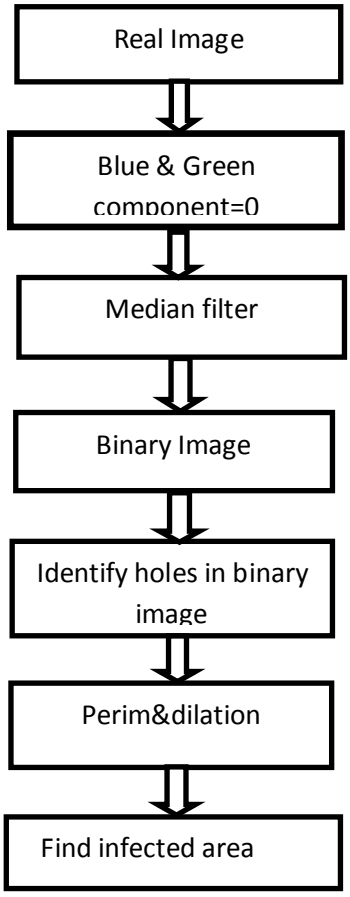


Fig.3.1flow chart for disease detection

3.4. Binary image
A binary image is a digital image that has only two possible values for each pixel. Typically the two colors used for a binary image are black and white though any two colors can be used. The color used for the object(s) in the image is the foreground color while the rest of the image is the background color. Binary images are also called bi-level or two-level. This means that each pixel is stored as a single bit (0 or1).the names black-and white, B&W, monochrome ormonochromatic are often used for this concept, but may also designate any images that have only one sample per pixel

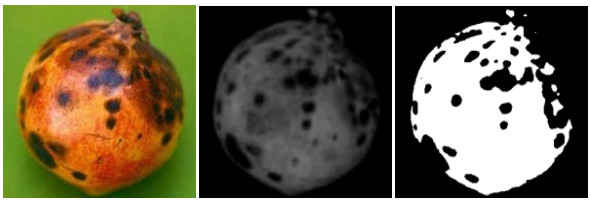
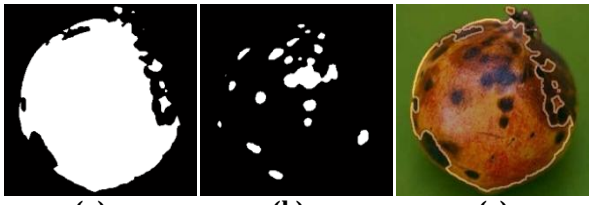


Fig.3.2 a) Origanal image b) Grey image c) Binary image

3.5.Perim&dilation
A binary image is containing only the perimeter pixels of objects in the input image. A pixel is part of the perimeter if it

is nonzero and it is connected to at least one zero-valued pixel. The default connectivity is 4 for two dimensions, 6 for three dimensions, and con for higher dimensions.

Dilation is one of the two basic operators in the area of mathematical morphology, the other being erosion. It is typically applied to binary images, but there are versions that work on grayscale images. The basic effect of the operator on a binary image is to gradually enlarge the boundaries of regions of foreground pixels (*i.e.* white pixels, typically). Thus areas of foreground pixels grow in size while holes within those regions become smaller.



(a) (b) (c)

Fig.3.3 a) Area detection b) Affecting area c) Dilation image

3.6. Alpha data

Alpha data is analogous to color data (e.g., the Data property of surfaces). When you create a surface, MATLAB rendering software maps each element in the color data array to a color in the color map. Similarly, each element in the alpha data maps to a transparency value in the alpha map. Interpret the values in alpha data as transparency values (data values must be between 0 and 1, or will be clamped to 0 or 1).

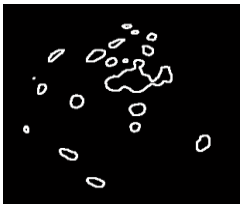


Fig.3.4 Disease area

The whole method can be divided into five step:

1) thresholding based on a constant 37% value,
2) smoothing by a binary filter,
3) segmentation by an 8-neighbor connected component labeling,
4) feature extraction (area, perimeter, compactness, elongation), and finally
5) classification by a linear decision function or a nearest-neighbor method.

Classification results around 89%-90% are obtained working at night and for mature fruits. During the day, 84% classification accuracy is declared.

In this method we found total pixelcount, redpixel count, Affecting area. We are run this algorithm we can found this counts. If no disease present in this image then also disease identify. That's why we give 1% thresholding. If this disease isgreaterthan 1% then display disease identify.

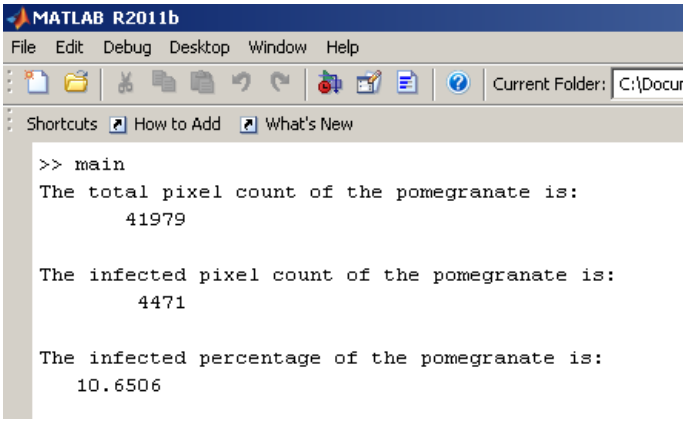
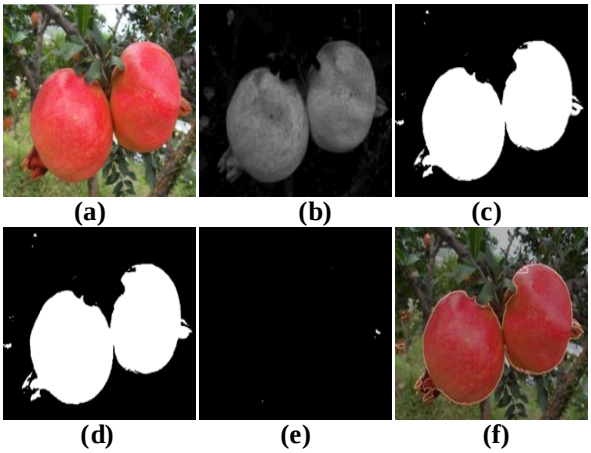


Fig. 3.5 check pixel count, infected pixel count, infected percentage

Now we take new sample this sample or image go to above process and check disease present or not if this disease presents greater than 1% then only disease detected otherwise it will display disease not present**.**



(a) (b) (c)

(d) (e) (f)

Fig 3.6 a)Original image b) Grey image c) Binary image d) Area Detection e) Affecting Area f) Dilation Image

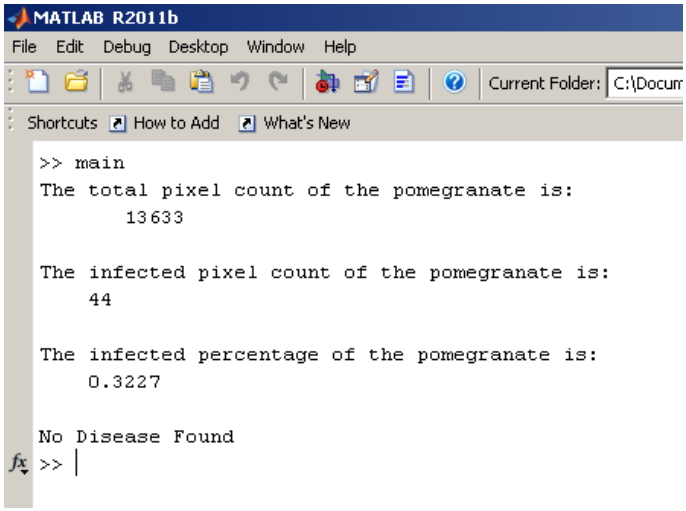


Fig 3.7 No disease found

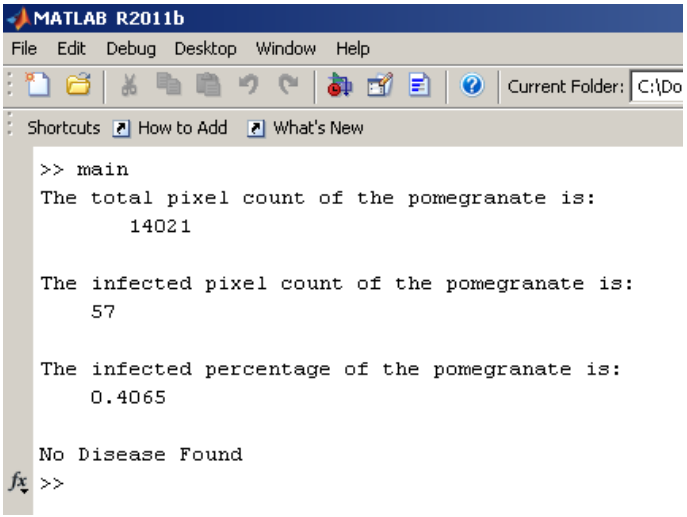


Fig.4.2 Pixel count and Infected percentage diseases

4. GRAPHICAL USER INTERFACE (GUI)

Short for Graphical User Interface, a GUI allows the use of icons or other visual indicators to interact with electronic devices; rather than using only text via the command line. For example, all versions of Microsoft Windows utilize a GUI does not. The GUI was first developed at Xerox PARC by Alan Kay, Douglas Engelhard, and a group of other researchers in 1981.

4.1.How does it work?

A GUI uses windows, icons, and menus to carry out commands, such as opening, deleting, and moving files. Although many GUI operating systems are through the use of a mouse, the keyboard can also be utilized by using keyboard shortcuts or arrow keys.

Fig.4.1 Disease detected and infected area in GUI

A) In this GUI we are load the camera getting image camera after 0.1 second getting new image and this image continues possessing.To check disease present or not, if yes disease presents then which disease present disease one or disease two then display and also show infected percentage. If not present then check next frame.

5. CONCLUSION

The module we have developedautomatically detects the disease and spays particular solution (solution one or solution two)only on affected part of fruit. Thus it efficiently reduced wastage of lakhs liter of water and thousand liters of medicine/ chemicals. We can ensure that the quality of fruit willnot be damaged due to excess use of chemicals and water.

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Authors

Ranjit B. Bharane, has received the B.Tech.in Electronics and Tele-communication from Dr. BabasahebAmbedkar Technological university, Lonerejune 2012, He is pursuing M.TECH-II in Electronics & Telecommunication Engineering from Symbiosis International University; Pune, India. His research interest includesDigital Image Processing.

Swati U. Kadlag, Has received the DiplomaElectronics from Mumbai University 1999, B.EElectronics from Pune University 2009, M.EElectronics from Shivaji University 2011. She has Overall 11 years of experience in teaching at degree level in various engineering and Technology Institutes of repute. Served in R&Dfrom Aug 2001-Sep 2002 with Electronic Switches private Ltd, Nasik. Currently, she is Faculty at Symbiosis Institute of technology pune, her research includes Application of RFID, and Image processing applied to toll plaza and check post, optical network design.

Dr. Narayan Pisharoty is working as a professor inElectronics and Telecommunication Department of Symbiosis Institute of Technology. He has 38 years of experience. His areas of interest cover RFID Application in Bio Medical Engineering, Alternate Energy Sources, and Application of microprocessors in Agriculture