RESEARCH ARTICLE OPEN ACCESS

A Survey make out of Lemon Fruit and Leaf Disease Utilizing Ways of Image Processing Techniques

Usha P [1], Dr.J.Vijayakumar [2]

[1], [2] Department of Electronics & Instrumentation, Bharathiar University - Coimbatore

ABSTRACT

Food is mostly the basic fundamental need of individual humans. The world's inhabitants are expanding day by day. So it has become crucial to growing enough amounts of crops to feed such as vast population. However, over time, citrus plants are influenced by different illnesses that cause significant harm the farming plant creations. The varieties of citrus fruits are lemons, mandarins, oranges, limes, grapefruits, and tangerines. The citrus (lemon) fruits have traditionally been used in cooking and healing every year 110-120 large indefinite quantities of tons of citrus waste are generated worldwide from citrus refining industries. This paper helps to observe various strategies applicable to lemon citrus, which leaves fruit sickness location and recognition and detail that affects the exposure and classifying lemon accuracy. This article provides a literature survey about the detection of citrus (lemon) fruit diseases using various image-processing, Image Segmentation, future extraction, and more classifiers in Digital image processing.

Keywords: - Lemon Images, Segmentation, Feature extraction, classifiers.

I. INTRODUCTION

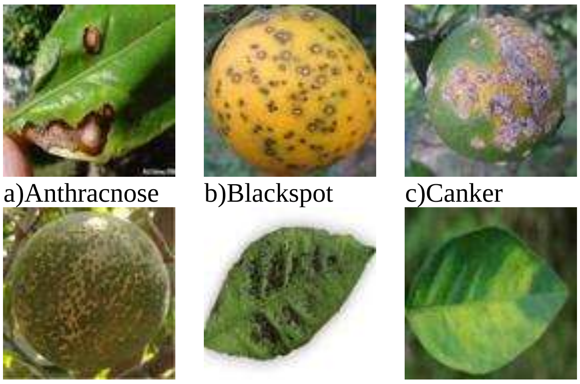
Agriculture is the origin of all culture's traditions. The plant disease is fundamentally in charge for the decrease underway which cases economic loses (1), we discussed the most significant fruit of citrus; Lemon is a somewhat evergreen tree nearby in Asia. In recent years, Lemon is sedative and antispasmodic utilizing for the medicinal process (9) Citrus fruits naturally contain fibre, vitamins, limonoids, carotenoids, and flavonoids. Value of Citrus fruits global production in Arizona 2019/20 is forecast down 5 86,000 tons.

However, in current years, citrus manufacturing is broadly affected by citrus (lemon) infections. In this look on, a few computerized arrangements have been suggested for the symptom-based detection of citrus plant diseases, and assuring results were recorded. Therefore, researchers are striving to find a novel computer-based solution for the early recognizable citrus sickness branch from the branch of image processing on present occasions. As the lesion spot detection and characterization comprise four fundamental steps, including Pre-processing, the next, Segmentation, Feature Extraction, and classification, most of the studies complete out in this concern are focusing on solutions in these lines. For the K-means cluster ring, Otsu thresholding, and the segmentation process is a lesion spot, region-based, region-oriented, and edge-based strategies have been defined.

This paper's remainder is standardized as follows; literature reviews briefly explain the image processing methods employed in plant disease identification, various classifiers used for citrus identification, and limitations are recognized.

II. INFECTED CITRUS DISEASES IMAGE

Citrus fruits and Leafs are susceptible to several fungal and bacterial diseases and insect pests. Different diseases of citrus are see Fig. 1 Anthracnose, Black spot, Canker, Scab, Melanose, and Greening



a)Anthracnose b)Blackspot c)Canker

d)Scab e)Melanose d)Greening

Fig. 1 Diseases of Lemon Leaf and Fruit diseased image

III. RELATED WORK ON CITRUS DISEASE DETECTION AND CLASSIFICATION

In this sector, the complete description of image processing proposes, which are applied for citrus disease detection and classification. Lemon fruits and leaves are included in these steps. Commonly, a computer-aided way based on image processing techniques consists of four primary steps including preprocessing, segmentation, feature extraction, and classification.

A. Preprocessing Techniques

The preprocessing level is essential for enhancing the contrast of a load image. Is obtained from sensors, and cameras have a lot of noise including poor background, which affects the segmentation accuracy. Here are few steps of image resizing, cropping, image converting, and image filtering, and image enhancement to enhance their accuracy. the primary images are caught handling a camera, and few images are collected from datasets. Furthermore preprocessing methodologies next, the segmentation is achieved by implementing several techniques including edge detection, region growing, and threshold-based segmentation processes on the infected areas, also formerly features are calculated of segment regions. The input of all images filtered via these top-hat techniques,[2]Shows Citrus infection field specialists manually catch-all images from the Sargodha region, Pakistan. The input of all images filtered via these top-hat techniques, and afterward, the Gaussian function is utilized to enhance this infected area's contrast. Furthermore, recommended a system to find the malformation or defectiveness in lemon leaf. Threshold-based image segmentation shows the back surrounding foreground models to help focus the leaf of the lemon plant was Median filter used [13] First, the sample leaves images are acquired and segmented into various parts using Low pass, High pass filters [20] and afterward, the Gaussian function,[14]presented algorithm segments the orange fruit of both NIR RGB pictures utilizing this Sobel-edge exposure technique. Hence, illumination and contrast equalization pre-processing steps are being used to decrease the misleading defect detection results.CLAHE is utilized to enhance this infected area's contrast.

Ref and Year	Diseases	Techniques	Performance measures and Results
Hafiz et.al(2019)	Blackspot,Canker, Melanose, Scab, Greening	Top hat filter, PCA	Classification
Shopy et.al.(2018)	Canker	Gaussian, CLAHE	Precision
J.Senthilet.al (2017)	armillaria root rot, bacterial blast, citrus nematode	Median filter , HOG,SVM	Precision
Ahmed et.al (2016)	Anthracnose, Stem-end unripe Green mold	Sobel-Edge detection, Contrast Equalization	Accuracy-95%
Thangadurai et.al(2015)	Canker	Gaussian, median, Low pass, High pass filters.	Disease Detection

Table 1 Comparison of Preprocessing based technique

B. Image Segmentation Techniques

Segmentation is a process used to rearrange the portrayal of an image toward something that is a more important question of enthusiasm from the foundation. In this survey, Segmentation is also done through color transform into YCbCr and bi-level thresholding [4].and K-means Clustering is used to create a cluster of the same pixels of an image. It covert n number of pixels into k number of clusters. K-means clustering method is used to segment the training data set based on the feature .mainly focused on the pre-processed fruit, then segmented the image using an Otsu method, Kmeans clustering. Clustering techniques divide an image into three parts for improved analysis and result from images. Moreover, classification is utilized to discover this image and performed by utilizing an SVM. After the training, SVM will compare the test images, and the style of the disease will be displayed as an outcome. [7].and Weighted segmentation methods are formed of these chi-square distances technique and threshold method concern implemented. We acquired average segmentation precision accuracy of 92.435% on all datasets utilized [3]. Prescribed input images converted from official RGB-color space to LAB color space. We applied both image-level and disease level classification [16] color difference-based algorithm of Delta E (DE) is applied for the segmentation of images by computing the length between color. Furthermore, the efficient knowledge of leaf disease system based on Gray-level threshold segmentation is adapted and the binary image is obtained. [21]

Ref and Year	Diseases	Techniques	Performance measures and Results
Muhammad et.al.(2018)	Anthracnose, Black spot, Canker, Melanose, Scab	lesion segmentation, Optimized weighted segmentation	Accuracy-citrus disease image gallery dataset-97% combined dataset-89% Our local dataset-90.4%
Rukaiyya et.al.(2017)	Canker, Anthracnose, Overwatering Greening	Color Transform YCbCr, Bi-Level Thresholding,	Accuracy-82.79%
Rohitranjan (2017)	Black spot	K-means Clustering, Ostu threshold,	Classification
H.Ali et.al.(2017)	Greening , Anthracnose , Downy	Delta Esegmentation RGB- HSV color histogram	Accuracy-99%
N.Sathyapriya et.al.(2016)	anthracnose stem-end injury, medfly egg deposition and green mould	Grey-level threshold segmentation. Canny edge detection algorithm	Prediction Accuracy - 86%

Table 2 Comparison of Segmentation based technique

C. Image Feature Extraction based Techniques

Feature extraction signifies an important function in the area of computer vision and machine learning for the type of objective in the input image. Each object must its shape, motion, size, color, and texture, so through feature extraction, the extracted object is classified into its relevance class. [5] Proposed the technique of recognition of healthy and unhealthy regions based on the texture and color features extraction using GLCM based Method. These system images are classified by the database picture formed on the affected threshold value. If the leaf is infected .specific disease name and solution is sent to the user and just shown as displayed using LCD.scaling, the threshold values are the best technique of detecting the disease. Because threshold value differs for each disease as reported by their features and affected areas [9].Pattern recognition algorithm, Savitzky-Golay smoothing method [15] using to preprocess the sensor response signals to less noise and environmental factors also utilized for the feature data extraction. First, [20] the example leaves images are obtained and segmented toward various sectors. Then color and texture features are extracted to recognize the leaf's disease and find out an optimum solution using a genetic algorithm. Neural-network classifier that classifies the citrus fruits based on mean, also conflict, and some other specialties of the red, green, blue color components of all images. Although the testing process takes only 0.1second per image, this approach positively affects the priming data set[23].also the Comparison of feature extraction techniques (see table 2.3)

Ref and Year	Diseases	Techniques	Performance measures and Results
Sharif et.al.(2017)	Anthracose, Blackspot, Canker, Melanose,Scab	HSV,LAB LUV,HIS GLCM feature	Accuracy-95.8%
Dhanaprabhu et.al (2017)	armillaria root rot, bacterial blast,nematode	histogram of oriented gradients, Gradient boosting algorithm	Prediction accuracy
Pranjali et.al(2016)	leaf diseases of grape	Downy Mildew color, Powdery Mildew texture feature	Accuracy Downy-93.33% Powderly-83.33%
Tao et.al (2019)	pest-infested citrus fruits	Savitzky-Golay,PCA,	Accuracy – 98.21%
Jose et.al (2009)	Peel defects	Sobel gradientmask, Distance-based classifiers	Prediction

Table 3 Comparison of feature extraction based technique

D. Image Classifier based Techniques

Classifiers-based procedures are appropriated for distinguishing the images depend on their feature extractions. Numerous classification methods are explained in this sector including SVM, ANN, PNN, BP, RBF, KNN, BPNN, and DT.[1]the supplement of this article incorporates reflecting turning and color manipulation utilize data augmentation images. This convolution layer network managed various parts to convolve the input picture 64×64 pixels image pooling process through the Stochastic pooling algorithm based on this sparsity in CNN configuration. Moreover, six convolutional layers, five batch norm layers, and 4 are pooling layers. The stochastic pooling-based CNN method is 100% accurate in classifying the sour lemons. Furthermore [4] classifying in light of Hidden -Markov Model classifiers. This method of application of image processing diagnoses leaf diseases. The efficiency of this model is 82.75%.image-acquisition is the primary step for using a computer-assisted camera to create a database [10] color-pace translation and image augmentation were done by picture pre-pre-processing. A discrete cosine transform domain is utilized for image enhancement. YCbCr color system and L*a*b color space decided for color space transformation. In feature extraction statistical method, And using GLCM to see measurements, for example, contrast, energy, entropy, and homogeneity using grey crop enhancement and the classification design is Support Vector Machine. CLAHE [12] in this step increases the contrast level of diseases affected leaf image, a segment of interest applying K means clustering. At the end of this process, the diseased portions of the leaves extract. the final stage of this study adopted the SVM classifier to distinguish the canker leaf image and perform these methods in lemon canker disease detection. Feature derivation is a phenotypic feature [17] it aims to map images to their similar disease classes created on the phenotypic properties before-mentioned as the texture, color, structure of holes on the fruit, and physical make-up. ANN, SVM are classifiers. ANN is pragmatic in gaining enhanced results to apprehension effectiveness, and classification has some benefits over the different algorithms. Deep learning realizes the citrus disease image dataset concerning 6-varieties of citrus disease is constructed with the experts' help. The citrus disease dataset was utilized for training the simplified Dense Net network, which improved classification precision and reduced prediction time consumption.DenseNet users collect the images of citrus diseases and upload images to our system through the trained model and return the diagnosis results and treatment advice to users [18].and further all classifier comparison techniques have been shown in Table 1.4

Ref and Year	Diseases	Techniques	Performance measures and Results
Ahmad et.al.(2020)	Healthy damaged lemons	Stochastic Pooling,CNN, KNN,SVM	Classification-100%
Shaikh et.al (2017)	Canker, Anthracnose, Overwatering, greening	Hidden Markov Model	Classification 82.75%
Pranjali et.al(2016)	Downy Mildew,	Texture, color SVM	Classification-88.8%

	Powdery Mildew, Anthracnose		
Benjamin et.al (2019)	Anthracose, Blackspot, Canker, Melanose,Scab	Phenotypic Features, Support Vector Machine, Artificial Neural Network	Accuracy- SVM-93.12% ANN- 88.96%
Shoby et.al (2012)	paddy blast, brown spot, narrow brown spot	Morphology, Texture, color SVM	-
Wenyan et.al (2019)	HLB, Anthracnose, Canker, Black spot, Sandpaper rust, Scab	Nginx server ,Dense Net WeChat applet ,Keras framework, Stochastic Gradient descent	Evaluation texture-88.53%

Table 4 Comparison of classifier based technique

IV. SURVEY ON PERFORMANCE ANALYSIS

The performance analysis of reviewed papers is compared based on its accuracy. The variables required to evaluate the accuracy includes True positive (TP), True negative(TN),False positive(FP),False negative(FN) of these four values TN and FN should be the lowest.

$$\text{Accuracy}=\frac{TP+TN}{TP+FP+FN+TN}$$

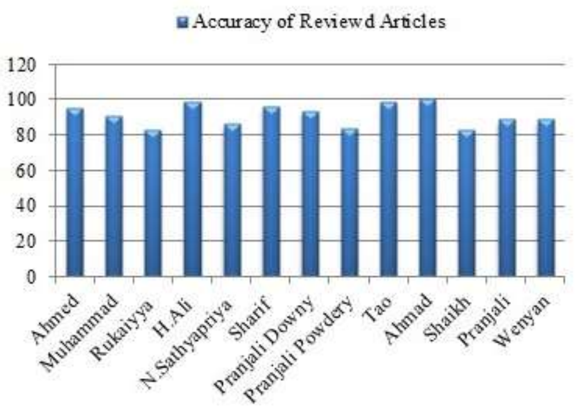


Fig 2. Comparison Analysis on Accuracy among the Reviewed Articles

Fig 2 .presents the comparison between the articles reviewed based on their accuracy .among the articles reviewed the Segmentation, feature extraction based on classifier [1] has the highest accuracy of 100%, they have included all techniques to find the lemon disease. And the papers which have used Savitzky-Golay [5, 3, and 15]95.8%recored with better accuracy compared to other techniques GLCM, HOG. The most common of classification is KNN, SVM, ANN [17, 18] is better higher efficient of disease classification.

V. CONCLUSIONS

In this analysis, numerous types of methodologies of image processing have discussed the acknowledgment of plant infections. This review consists of the four most steps: preprocessing, segmentation, feature extraction, and classification. Citrus fruits of (lemon), Grape, Paddy, leaves, and Orange specifies tested by various algorithms and methods. Another advantage of these methods identified at the first stage of plant infection and Fruit disease. Throughout the survey, we achieve that preprocessing techniques help to increase this segmentation accuracy. Also, we achieve that Kmean-clustering the most excellent method for this segmentation of infected plants. Also, the texture features are most outstanding for representing disease in the image, and those innovations are utilized by SupportVector Machine (SVM) and GLCM, Artificial-neural network (ANN). Thus their efforts are needed to implement an effective, fast, accurate, and automatic system for disease detection on the natural citrus leaves.

ACKNOWLEDGMENT

I would also like to express my sincere gratitude to my guide Prof. Dr.J.Vijayakumar of Department of electronics and instrumentation, Bharathiar University, Coimbatore for getting me interested in the field and assisting me to identify the area of investigation. Furthermore, I would like to thank all my family members, friends for being with me alongside to give me valour and grit to carry out all the immense works that have lead me to this position.

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