RESEARCH ARTICLE OPEN ACCESS

Image Processing Techniques in Agriculture for Plant Disease Detection

Dr. S. Sahaya Tamil Selvi
Associate Professor and Head, Department of computer science
St. Joseph's college for women- Tirupur- India.

ABSTRACT
Image processing has been proved to be an efficient platform for study in various fields and applications. In the field of agriculture the quantity and quality of the products are the important factors. The identification of diseases at proper time will prevent the farmers from loss. This paper discusses about the various methods and techniques involved in the field of image processing to detect diseases in various types of plants. One of the biggest revolutions of modern history is the invention of agriculture for a healthier lifestyle. It significantly changed the human culture and played an important role in the development of the population and biological improvements in food production and domestication.
Keywords - Machine learning, image processing, leaf disease, SVM..

I. INTRODUCTION

Plant checking is important to control the spread of a malady yet its expense might be high and thus, the makers frequently skirt basic preventive methodology to keep the creation cost low. Albeit, official infection acknowledgment is a duty of expert agriculturists, minimal effort perception and computational helped analysis can adequately help in the acknowledgment of a plant ailment in its beginning periods. Image processing strategy which is equipped for changing over a picture into advanced shape and it plays out specific tasks on picture, in order to accomplish an upgraded picture or to extricate some fundamental data from it. The following figure 1. shows the normal and defected leaf.

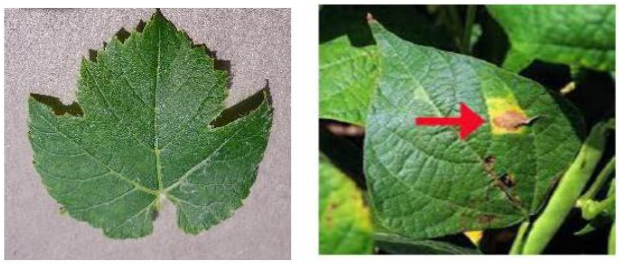

Fig 1. a. Normal Leaf b. Defected Leaf

II. IMPLICATION OF IMAGE PROCESSING IN AGRICULTURE

Accuracy agribusiness is another and creating innovation which prompts joining the propelled systems to upgrade to cultivate yield and furthermore enhance the homestead contributions to productive and naturally sensible way. Ranch inputs were imperative parameters to be controlled and if not will result in unfriendly impacts causing decrease in yield, crumbling plant well-being, and so forth. Water system/Water pressure, Fertilizers, pesticides and nature of yield were the central point of worry in horticulture. More often than not the aptitude is required to break with the issues, which might be tedious and exorbitant issue in creating nations. Picture preparing is one of the apparatuses which can be connected to gauge the parameters identified with agronomy with precision and economy. Utilizations of picture preparing for farming can be comprehensively ordered in two classes: initial one relies on the imaging systems and the second one dependent on applications..

III. LITERATURE ON LEAF BASED DISEASES DETECTION

Srilakshmi [1] [2018], Agriculture assumes an essential job in nation's economy and it has a broad commitment towards human progress. Because of the developing extensions in sensor gadgets, RFID and Internet conventions the engineering of Internet of Things (IoT) has been made to help farming by making a Smart agribusiness.

Dixit Ekta Gajanan [2] [2018], Although proficient horticulture engineers are in charge of the acknowledgment of plant ailments, smart frameworks can be utilized for their finding in beginning times. The acknowledgment of a sickness can frequently be founded on manifestations like sores or spots in different parts of a plant. The shading, territory and the quantity of these spots can decide, all things considered, the sickness that has humiliated a plant.

Saradhambal.G [3] [2018], Crop cultivation plays an essential role in the agricultural field. Presently, the loss of food is mainly due to infected crops, which reflexively reduces the production rate.We propose an enhanced k-mean clustering algorithm to predict the infected area of the leaves. A color based segmentation model is defined to segment the infected region and placing it to its relevant classes. Experimental analyses were done on samples images in terms of time complexity and the area of infected region. Plant diseases can be detected by image processing technique.

IV. PROPOSED METHODOLOGY

Plant illnesses can expand the expense of agrarian generation and may reach out to add up to financial debacle of a maker if not restored properly at beginning times. The makers need to screen their yields and identify the primary indications with the end goal to keep the spread of a plant illness, with minimal effort and spare the significant piece of the creation. In this proposed framework we have given an answer to recouping from the leaf illnesses and furthermore demonstrate the influenced piece of the leaf by picture preparing method.

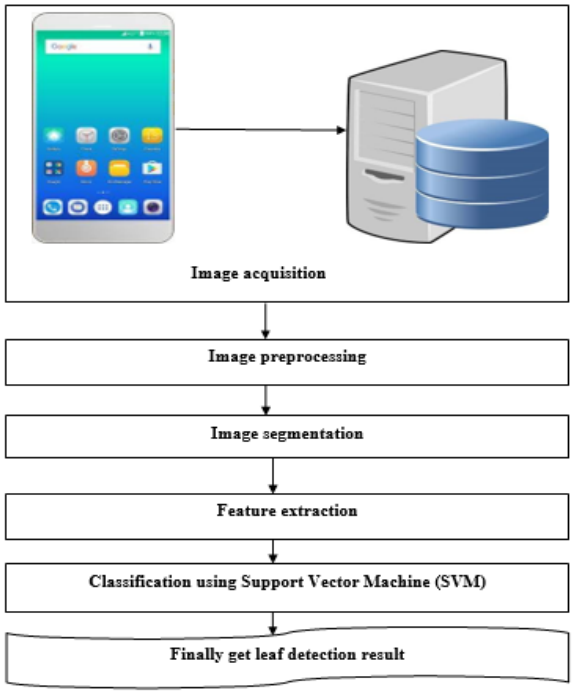

Fig 2. Block diagram for leaf defect detecction

a. Image acquisition

The first stage of any vision system is the image acquisition stage. After that sample images are obtained or collected from the farm of grape using different mobile cameras with different resolutions. Which are used to train the system. These sample images are stored in standard jpg Joint Photographic Experts Group (jpg) format. All the sample images are in RGB (Red, Green, and Blue) form. Collected images include the healthy leaf as well as affected leaf by different diseases like bacterial spot, black measles, black rot, leaf blight, leaf curl virus etc. Various methods of processing can be applied to the image to perform the many different vision tasks required.

b. Image Pre-Processing

An input image has some unwanted noise as well as redundancy present in it. So pre-processing techniques are used for noise removal, contrast enhancement and illumination equalization. To remove the background noise as well as to suppress the undesired distortion this is present in it. These types of variations are occurred due to many reasons such as camera settings, variation in light etc.

c. Image Segmentation

In computer vision, image segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries in image. In this work segmentation algorithm has been adopted.

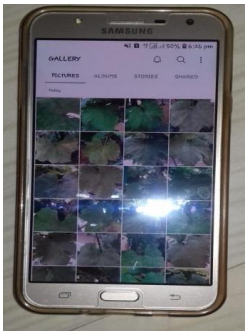

Fig. 3 Capturing leafs are stored in gallery

d. Feature Extraction

The segmented image is first selected by manual interference. The affected area of the image can be found from calculating the area connecting the components. First, the connected components with 6 neighborhood pixels are found. Later the basic region properties of the input binary image are found. The interest here is only with the area. The affected area is found out. The percent area covered in this segment says about the quality of the result.

e. Classification

The current framework can just recognize the sort of ailments which influence the leaf. The proposed leaf infection characterization is utilized by Support Vector Machine (SVM) classifier calculation. By the utilization of Support Vector Machine (SVM) classifier calculation, the tainted locale of the leaf is divided and dissected. The pictures are sustained to this application for the grouping of the maladies. It gives a decent decision on horticulture network especially in remote towns. It goes about as a proficient framework as far as arranging the tainted district. Highlight grouping system serves to classifications the tainted leaf and furthermore to order the plant infections. These are altogether finished with the assistance of the advanced mobile phone to catch the pictures.

Support Vector Machines (SVMs), unmistakably a standout amongst the most mainstream and compelling machine learning calculations broadly utilized in grouping and acknowledgment errands in administered learning. The SVM calculation predicts the event of coronary illness by plotting the ailment, foreseeing properties in multidimensional hyper-plane and characterizes the classes ideally by making the edge of two information groups. This calculation achieves high exactness by the use of nonlinear capacities called parts. The

technique utilizes many shading portrayals all through its execution. The division of leaves and foundation is performed by a Multilayer Perceptron (MLP) neural system that is including a shading library structured from the earlier by proposing that of an unsupervised Self-sorting Out Guide (SOM).

V. RESULT AND DISCUSSIONS

Based on the evaluation metric, the metrics are calculated and the success rate is measured. Classification.

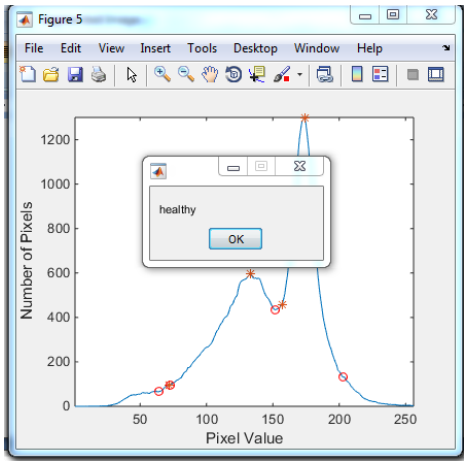

Fig. 4 Sample classification output for normal leaf

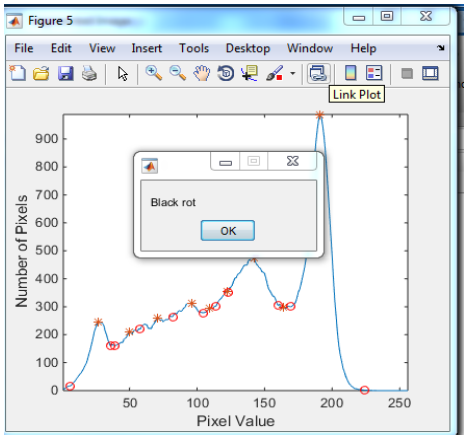

Fig. 5 Sample classification output for defected leaf

Metric	Formulas
Accuracy	**(TP+TN)/(TP+TN+FP+FN)**
Sensitivity	**TP/(TP+FN)**
Specificity	**TN/(TN+FP)**
Precision	**TP/(TP+FP)**
Recall	**TP/(TP+FN)**
Fmeasure	**2*Precision*Recall/Precision+Recal**
Gmean	**√Sensitivity+Specificity**

Table 1: Evaluation Metrics

Parameters	Existing	Proposed
Accuracy	65.0631	80.3550
Sensitivity	65	88.4443
Specificity	57.8767	76.8687
Precision	20.6471	39.7543
Recall	65	88.4443
Fmeasure	38.0860	65
Gmean	63.3535	74.9074

Table 2: Performance Evaluation Metrics of Normal leaf.

Parameters	Existing	Proposed
Accuracy	64.0541	85.9780
Sensitivity	60	80.3233
Specificity	60.8767	75.9667
Precision	27.6871	45.7453
Recall	60	80.3233
Fmeasure	38.0870	60

Gmean	55.3835	77.8024

Table 3: Performance Evaluation Metrics of diseased leaf.

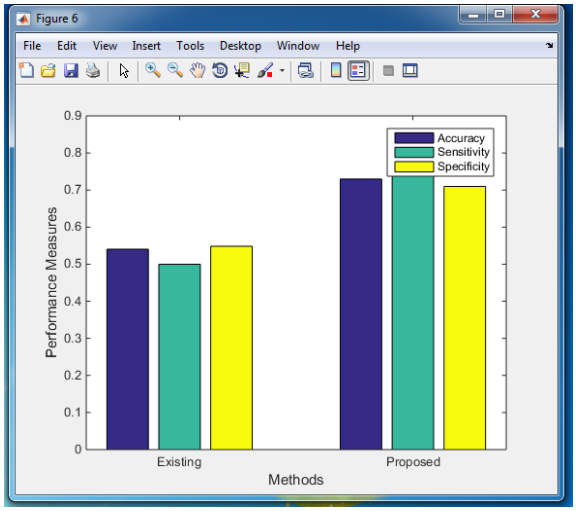

Fig. 6. Performance Evaluation Metrics of Normal leaf.

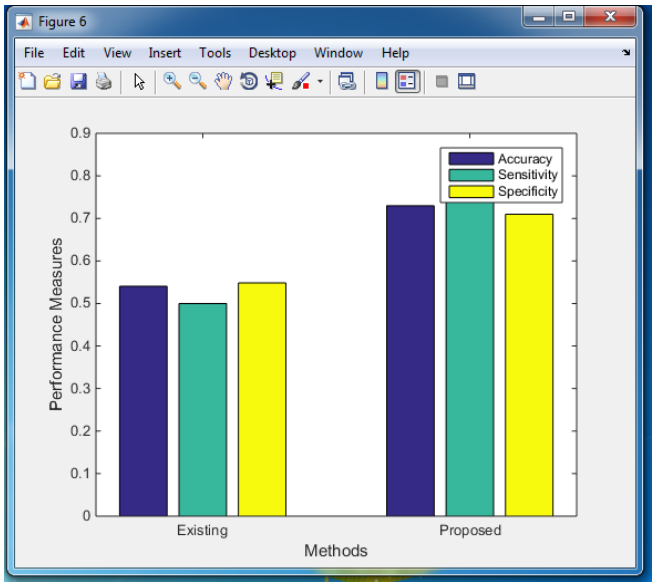

Fig. 7. Performance Evaluation Metrics of diseased leaf

IV. CONCLUSION

The work uses to investigate the leaf infection arrangement at an inopportune environment. The SVM characterization calculation has been proposed to order the malady in the plant disease detection system. Plant ailments can be identified and arranged by image handling strategy by utilizing the element of the ailment. This framework works well for the detection of infection which was influenced in the plant. The proposed gives the detection with the accuracy of 85.9570.

REFERENCES

[1] Rothe, P. R., and R. V. Kshirsagar. "Adaptive neuro-fuzzy inference system for recognition of cotton leaf diseases." 2014 Innovative Applications of Computational Intelligence on Power, Energy and Controls with their impact on Humanity (CIPECH). IEEE, 2014.

[2] Jafari, M., S. Minaei, and N. Safaie. "Detection of pre-symptomatic rose powdery-mildew and gray-mold diseases based on thermal vision." Infrared Physics & Technology 85 (2017): 170-183.

[3] Saradhambal.G, "Plant Disease Detection And Its Solution Using Image Classification",IJPAM, Volume 119 No. 14 2018, 879-884 Ferentinos, Konstantinos P. "Deep learning models for plant disease detection and diagnosis." Computers and Electronics in Agriculture 145 (2018): 311-318.

[5] Lv, Jidong, and Liming Xu. "Method to acquire regions of fruit, branch and leaf from image of red apple in orchard." Modern Physics Letters B 31.19-21 (2017): 1740039.

[6].Narendra V G, Hareesh K S, "Prospects of computer vision automated grading and sorting systems in agricultural and food products for quality evaluation", International Journal of Computer Applications,Volume 1 – No. 4, pp 1-12, 2010.

[7]. Mutlu Ozdogan , Yang Yang, George Allez and Chelsea Cervantes, "Remote Sensing of Irrigated Agriculture: Opportunities and Challenges", Remote Sensing, 2, pp- 2274-2304, 2010.

[8]. M. Omid, M. Abbasgolipour, A. Keyhani and S.S. Mohtasebi, "Implementation of an Efficient Image Processing Algorithm for Grading Raisins", International Journal of Signal and Image Processing, Vol 1, Issue 1, pp- 31-34, 2010.