Image processing Based Detection and classification of leaf disease on fruits crops

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Abstract—An automatic leaf disease detection is the very important research topic in agriculture field as it may prove benefits in monitoring and controlling large fields of crops, and thus automatically detect diseases as soon as they appear on plant leaves. For excellent use of pesticide and to minimize the economical loss, the identification of disease severity is main factor. The disease is usually used for destruction of live plants. This paper provide description of leaf disease detection using image processing that can recognize problems in crops from images, based on colur, texture and shape to automatically detect diseases and give the fast and accurate solutions to the farmer. The methods studies are for improve throughput and it will reduce subjectiveness which is arising from human experts in detecting the leaf disease. digital image processing is a main technique which is used for enhancement of the image. To upgrade agricultural products automatic detection of disease symptoms is beneficial. The design and implementation of these technologies which is totally automatic and it will greatly aid in selective chemical application, reducing costs and thus leading to increased productivity, as well as improved produce.

Index Terms—Image Processing, Raspberry Pi, GPRS

I. INTRODUCTION

India is well known for agricultural country; wherein about70% of the population depends on agriculture. Farmers have wide range of multiplicity to select suitable crops for their farm. However, the cultivation of these crops for optimum yield and quality produce is mostly technical. It can be improved by the aid of technological support. The management of perennial crops requires close controlling especially for the management of diseases that can affect production significantly and afterwords the post-harvest life. The image processing is best technique used in agricultural applications for following purposes. Predict plant disease from image of plants. The plant disease diagnosis is limited by human visual capabilities because most of the first symptoms are microscopic. This process is tedious, time consuming. There is need for design system that automatically recognizes, classify and quantitatively detects plant disease symptoms.

In case of plant disease the disease is known as any impairment of normal physiological function of plants, producing characteristic symptoms. A symptom is a reality accompanying something and is observed as evidence of its existence. Disease is caused by pathogen which is any agent causing disease. Disease management is a challenging task. Mostly diseases are seen on the leaves on plants or stems of the plant. Precise quantification of these visually observed diseases, pests, traits has not studied yet because of the complication of visual patterns .In most of the cases diseases are seen on the leaves or stems of the plant. Therefore recognition of plants, leaves and finding out the diseases, symptoms of the disease attack, plays a important role in successful cultivation of crops.

Hence developing a computer vision system to detect, recognize, and classify disease affected on crops which will avoid human interference and hence lead to précised unbiased decision about disease infection and its further valuation. The development of an automated system also help farmers avoid consulting divine. Automatic detection of leaf diseases is most important research topic as it may prove gain in monitoring large fields of crops, and thus automatically detect the diseases from the symptoms that present on the plant leaves. This enables machine vision that is to provide image based Here image processing plays important Role. The system provides the facility to Capture image, process it and get result through image processing.

In the real world, farmers visually carry out inspection of crops such as fruits ,vegetables and the like affected by the different disease for recognition and classification. In recent literature, the image processing techniques are being widely and efficiently used in agricultural field for disease detection and classification. Tuker and Chakraborty,(2008) have presented software which detects, characterized and calculated percentages of leaf area diseased using digital image processing. Al-Bashish et al. (2011) developed a fast and accurate method in which the leaf diseases are detected and classified with the help of k-means based segmentation and neural networks based classification. Automatic classification of leaf diseases is based on high resolution multispectral and stereo images (Bauer et al., 2011).Sugar beet leaves are used in this approach.

In [3],The paper consists of two phases to identify the affected part of the disease. Initially Edge detection based Image segmentation is done, and at lastly image analysis and classification of diseases is carried out using our proposed Homogeneous Pixel Counting Technique for Cotton Diseases Detection (HPCCDD) Algorithm. The goal of this research work is identify the disease affected part of cotton leaf sport by using the image analysis technique.

In [4], present paper to detection of leaf diseases. In this used method is threefold: 1) identifying the infected object based upon k-means clustering; 2) extracting the features set of the infected objects using color co-occurrence methodology for texture analysis; 3) detecting and classifying the type of disease using NNs, moreover, the presented scheme classifies the plant leaves into infected and not-infected classes.

In [5], The process of image segmentation was analyzed and leaf region was segmented by using Otsu method. In the HSI color system, H component was chosen to segment disease spot to reduce the disturbance of illumination changes and the vein. Then disease spot regions were segmented by using Sobel operator to examine disease spot edges. Finally plant diseases are graded by calculating the quotient of disease spot and leaf areas.

II. ARCHITECTURE OF SYSTEM

The architecture of Automatic Detection and classification of leaf disease is shown in following fig.

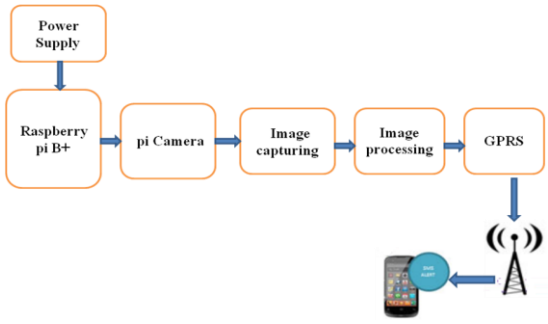


Fig 4.1 Architecture of the Detection and Classification of leaf disease system.

First, the real time images of various leaves are acquired using a pi camera. Camera interfacing with raspberry pi is very easy. The Raspberry pi board mosltly is used to acquired the images of the crops from camera output. Raspberry pi perfect for any automation.Then various image-processing methods are applied to the acquired images to getting useful features that are important for next analysis process. Preprocessing will also consisting of conversion of RGB to grey, as grey scale image gives perfect accuracy to defect detection. Feature extraction process will consists actual disease detection from an image by comparing the image with non-defected images. After that, many analytical techniques or methods are carried out to classify the images according to the perticular problem at hand. Finally detected and classified disease will be send to the mobile phone.

III. TECHNOLOGIES

A. Opencv

OpenCV stands for Open Source Computer Vision. It is an open source computer vision and machine learning software library .It is a library of programming functions mainly aimed at real-time computer vision. OpenCV is mostly written in C,C++ and its primary interface is in C++, but it still retains a less comprehensive though extensive older C interface.

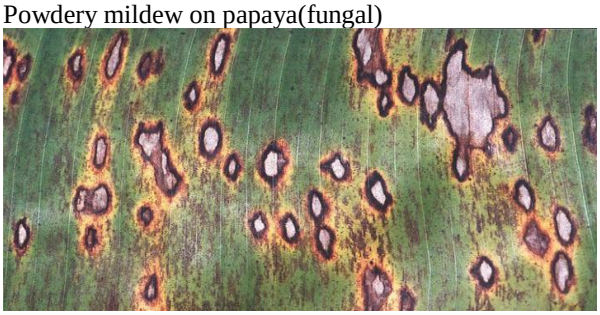
B. Python

Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed. Python is a scripting Language that means it allows to execute the code line by line

IV. EXPERIMENTS AND RESULTS

The image of leaf is capture by camera. acquired leaf images are converted into gray image. Captured leaves with various diseases like early scorch, yellow spots, brown spots, late scorch, bacterial and fungal diseases are shown in Fig.

Powdery mildew on papaya(fungal)



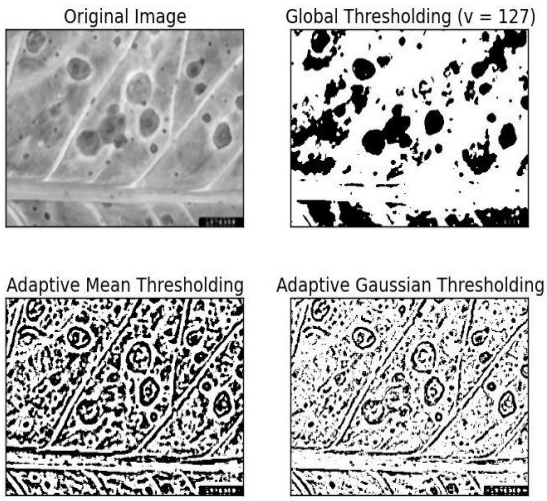
Yellow sigatoka on banana(fungal)

Bacterial disease in mango

curl disease on papaya(viral)

A. Segmentation

In this stage the concept of the intensity difference between leaf defected area used to segment leaf from background. After applying pre-processing stage, the outcome of image is feeding to the segmentation stage. Segmentation is carried out based on histogram thresholding and morphological operations. Mathematical morphology is a major tool for segmenting images and also it is useful to describe region shape such as region shape, skeleton, boundaries and texture. First step in this segmentation stage is to find out lower and upper threshold value from histogram image of saturation image. Then divide the saturation image into two binary images based on these threshold values. Thresholding is one of the techniques used for to segment the objects from background. thresholding is carried out using binary images. It is shown in following fig.



V. CONCLUSION

Plant Disease management is a challenging task.In that mostly diseases are seen on the leaves of the plant. Basically there are three main types of Leaf disease, they are Bacterial, Fungal and Viral. There is main characteristics of disease detection are speed and accuracy. Hence working on development of automatic, efficient, fast and accurate which is use for detection disease leaf. Work can be extended for development of machine vision system that automatically recognizes, classify and quantitatively detects leaf disease symptoms.

The objective of this work is the detection, classification of leaf diseases affecting on the fruits crops using image processing tools and all information about the disease is send to the farmer's mobile phone through the GPRS. To increase the speed and accuracy of detection and classification of leaf diseases we using Raspberry pi module. The design and implementation of these technologies will greatly aid in selective Agriculture application, reducing costs and thus leading to improved productivity.

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