

Identification of Cotton Leaf Diseases Using Raspberry Pi: A Review

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ABSTRACT: Identification of diseases on plant is the very important research topic in agriculture field. It is required for effective monitoring and controlling large fields of crops. Plant disease detection using image processing that can recognize infections in crops from its images parameters like colour, texture and shape. Digital image processing is a key technique which is used to extract the features from image of infected plant. Finally image features compare and result is available. The design and implementation of this automatic system will provide much information in selective chemical application, reducing costs and thus leading to increase in productivity as well as quality of product.

KEYWORDS: Plant leaf diseases, Agriculture application, Raspberry pi developing board

I. INTRODUCTION

India is well known for agricultural economy. About seventy percent of the population depends on agriculture. Farmers have wide range of variety to select suitable crops for their farm. The continuous demand for food with an increasing population, reductions in agricultural land, climate change the agriculture industry continues to search for new ways to improve production. Hence researchers from multiple disciplines are searching for ways to incorporate new technologies and precision into the agronomic systems. There is a need for efficient and precise techniques of farming, enabling farmers to put minimal inputs for high production.

India accounts for approximately 25 percent of world's cotton area and 16 per cent of total cotton production. Maharashtra is the important cotton growing state in India with 3.13 million hectares area. About 3 million farmers are engaged in cotton cultivation in the state mostly in region of Marathwada and Vidarbha.[6,8] Cotton crop provides basic raw material for cotton textile industry.

The largely affected part for the disease is leaves of the plant. About 80 to 90% of disease on the plant is on its leaves. The diseases on the cotton leaves are classified as Bacterial disease like Bacterial Blight, Fungal diseases like Anthracnose, Leaf Spot and Viral disease like Leaf Curl, Leaf Crumple.[7] Farmers judge the diseases by their experience but it is not accurate and proper way. It can be improved by the aid of technological support. The image processing is technique used in agricultural applications for predicting plant disease from image of plants. Cotton crop faces many problems due to diseases which affect it a lot and it is not possible to identify it by naked eyes. We require the system which can provide the exactly differentiate the variation of features present on plant images and depending upon that variation the further compare with database of stored image features.

II. LITERATURE REVIEW

In agricultural research, automatic disease detection on crop leaf is essential research topic as it monitors large crop fields and thus automatically detects disease as soon as they appear on plant. To improve agricultural products,

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automatic disease detection of crop is beneficial. This literature review is used to study different types of crop leaf disease detection techniques.

Authors in [1] explained their research on severity of brown spot disease is measured with the help of image processing technique. Brown spot causes reddish-brown to dark-brown spots on sugarcane leaves. The spots are oval in shape, often surrounded by a yellow halo and are equally visible on both sides of the leaf. The accuracy of the algorithm is tested by estimating the percentage standard known area covered by standard known area shapes like Triangle, Circle, Square, and Rectangle. Estimated values are compared with actual area covered to calculate Percentage Deviation and Percentage Accuracy of the algorithm. Disease symptoms of the plant vary significantly under the different stages of the disease so to the accuracy with which the severity of the disease measured is depends upon segmentation of the image.

Author in [2] explained application of texture statistics for detecting the plant leaf disease. Firstly by colour transformation structure RGB is converted into HSV space because HSV is a good colour descriptor. Masking and removing of green pixels with pre-computed threshold level. Then in the next step segmentation is performed using 32X32 patch size and obtained useful segments. These segments are used for texture analysis by colour co-occurrence matrix. Then texture parameters are compared to texture parameters of normal leaf. Finally the presence of diseases on the plant leaf is evaluated.

Author in [3] introduced Clustering Method which is an iterative technique that is used to partition an image into clusters. The difference is typically based on pixel colour, intensity, texture, and location, or a weighted combination of these factors. More commonly used clustering algorithms are K – means algorithm, fuzzy c-means algorithm, expectation maximization algorithm. The quality of the final result of the clustering method depends mainly on the initial set of clusters. Since the algorithm is extremely fast, a collective method is to run the algorithm several times and select the best clustering obtainable. A drawback of the clustering algorithm is that the number of clusters is an input parameter. A wrong choice of number of clusters may yield poor results. The algorithm also assumes that the variance is an appropriate measure of cluster scatter.

Author in [4] proposed the method in which First, Initialize the training database; resize the images 150*150 size. Next Edges detected by using Canny with Sobel techniques are combined, finally find out edge features. Mean or average filter was used to remove the noise. Features extracted from the test image are compared with the features available in the training set. Here skew divergence distance measurement has been used to find out the colour, Edge and texture features. The proposed Skew divergences method gives increase accuracy rate.

The approach proposed by author in [5] demonstrated that the identification of Bacterial Blight, Myrothecium and Alternaria is achievable using colour features such as mean and standard deviation of the intensity of pixels creating spots in three classical planes; red, green and blue of the segmented images and shape features such as area, sharpness, perimeter, Eigen values and aspect-ratio. Segmentation involves separating an image into regions corresponding to objects. Usually by identifying common properties the regions are segmented. The simplest property that pixels in a region can share is intensity. So, a natural way to segment such regions is through thresholding, the separation of light and dark regions. Support vector machines are used as a classifier in the work because their performances are superior to other learning algorithms.

The image processing technique had developed by author in [9] were used to deploy the classification system. In this work Scale Invariant Feature Transform is used to get features from the disease affected images. Then these features are taken to recognize the image using Support Vector Machine and k-Nearest Neighbors. This work mainly concentrates on three main diseases of paddy plant namely Brown spot, Leaf blast and Bacterial blight. It is useful to farmers and agriculture related researches.

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III. PROPOSED WORK

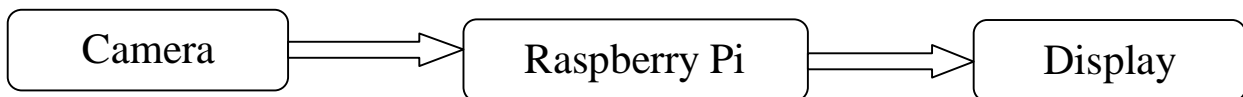


Fig.1 System block diagram

At first the real time images of various leaves are acquired using a camera. Camera interfacing with raspberry pi is very easy. The Raspberry pi board mostly is used to acquire the images of the crops from camera output. Real-time image acquisition creates a stream of files that can be automatically processed. Infected plant images were taken as a sample data for training purpose which is in the specific dimension range. Masking is a filtering process in which separating an image from its background and place the image over another background. Then image-processing methods are applied to the acquired images to getting useful features that are important for next analysis process. Feature extraction process consist actual disease detection from an image by comparing the image with defected images. After that analytical method is carried out to classify the images according to the particular problem at hand. Finally detected and classified disease will be shown on display screen.

IV. CONCLUSION

A fully automatic system can be design for accurate detection of cotton plant diseases using simple camera, Raspberry Pi board and display. The system is implemented using image processing algorithms to detect and classify the infected plant. This results in proper and accurate diagnosis of crop leading to enhancement of agriculture production. The proposed method can process, analyse and recognize the cotton plant leaf disease based on shape, size, colour and texture feature

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