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Plant Disease Detection and Solution System

Akshara Premnath[1], Mrs. V. Manoranjithem[2]
[2]*Department of Computer Science and Information Technology, KARE, Krishnakovil*
[1]*Assistant professor, Department of Computer Science and Information Technology, KARE, Krishnakovil*

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Abstract: ***For preventing losses in the yield and quantity of the cultural product, Classification is performed, if proper analysis is not taken in this approach or classification, then it produces serious effects on plants and due to ich respective product quality or productivity is affected. Disease classification on the plants is very critical for supportable agriculture. It is very difficult to monitor or treat plant diseases manually. It requires a huge amount of work and also needs excessive processing time, therefore image processing for the detection of plant diseases. Automatic fruit disease detection and grading is a creative strategy.Bacterial Blight, Fruit Spot, Fruit Rot, and Virus Diseases on Fruits are the modules identified in this investigation.For the identification of diseases and their critical processes, including as photosynthesis, transpiration, pollination, fertilisation, germination, and some fruit diseases, molecular methods and profiling of volatile organic chemicals in plants are applied.The classification of plant diseases includes the processes of loading the image, pre-processing, segmenting, feature extraction, and SVM classifier.***
Keywords: Agricultural, Bacterial Blight, PhotoSynthesis, Segmentation, SVM.

I. INTRODUCTION

India is a cultivated country and about 80% of the population depends upon agriculture. Farmers have a large range of differences in foinelecting various acceptable crops and finding the table herbicides and pesticides for the plant. plants on plant lead to a convincing reduction in both the quality and productivity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on plants.

Support Vector Machines (SVM) classification approaches are proposed and used in this paper. The health of plant leaf and disease on plant leaf plays an important role in the successful cultivation of crops on the farm. In the early days, analysis of plant diseases was done manually by the expert person in that field only. This requires a huge amount of risk and also requires excessive processing time.

The paper can make advantage of image processing techniques.The leaves, stems, and fruit are typically where illness symptoms are visible.Image processing, one of the technologies that is now evolving quite quickly, primarily involves thinking of images as signals while using signal processing techniques.It has applications in many different areas of business.Under engineering and computer science regulations, image processing is also regarded as a core research field.The following three steps are included in image processing:

1) Using a digital camera or an ocular scanner to import the image.
2) Analyzing and manipulating the image, which includes data compression, image augmentation, and the detection of patterns that are invisible to the human eye, such as those seen in satellite images. The final step before the result of an image analysis-based report or image can be adjusted is output.

II. LITERATURE REVIEW

In order to enable a recognition process to identify the chilli plant disease through the leaf images, the input image was enhanced to preserve information of the affected pixels before extractingthe chilli leaf image from the background.[1] This paper describes an image processing technique that identifies the visual symptoms of chilli plant diseases using an analysis of coloured images. The color model respectively was used to reduce the effect of illumination and distinguish between chili and non-chili leaf colors efficiently and the resulting color pixels are clustered to obtain groups of colors in the image.

[2] This paper introduces an innovative approach to automatically detect and grade the diseases on pomegranate fruit Module identification of this paper is Bacterial Blight, Cercospora fruit spot, Fruit Rot, and Alternaria fruit Spot diseases on pomegranate fruit. Molecular techniques and profiling of plant volatile organic compounds were used for disease detection and its vital functions such as photosynthesis, transpiration, pollination, fertilization, germination, and some pomegranate fruit disease.

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[3] This paper connected to spectroscopic and imaging-based, and volatile profiling-based plant disease detection methods, Segmentation of leaf image is important while extracting the feature from that image, Methods of this spectroscopic and imaging techniques are fluorescence imaging, multispectral or hyperspectral imaging, and infrared spectroscopy.The fluorescence was steady at certain frequencies such as 450, 550,690, and 740 nm, and provide the difference between the fluorescence at 550 and 690nm was higher in the diseased portion of the leaves, while it was very low for healthy regions of the leaves.Quadratic discriminated analysis (QDA) was used for analysis, QDA classified healthy and diseased plants with an accuracy of 71% and 96%, respectively.

III. METHODOLOGY

A. *SVM Classifier*

1) *Step 1:* Load leaf image in RGB format
2) *Step 2:* Contrast image gives an accuracy of affected image
3) *Step 3:* Pre-processing
4) *Step 4:* Segmentation of the k-means method is considered as a binary image from the grey image process:

Separate pixels into two clusters

a) Then find the mean of each cluster.
b) Square the difference between the means.
c) Multiply the number of pixels in one cluster times the number in the other

5) *Step 5:* Feature extraction is identifying the disease and the morphological method provides a better result
6) *Step 6:* SVM classification is a built-in method that can provide classified result

B. *Convolutional Neural Network (CNN)*

The phrase "convolutional neural network" refers to a network that uses the convolution mathematical technique. Convolutional networks are specialised varieties of neural networks that substitute convolution at at least one layer for conventional matrix multiplication.

Because of how closely the connectivity pattern between neurons mirrors the structure of the animal visual cortex, convolutional networks were inspired by biological processes. Only in the constrained area of the visual field known as the receptive field do individual cortical neurons respond to inputs. Different neurons' receptive areas partially overlap one another to fill the whole visual field.

Comparatively speaking to other image classification algorithms, CNNs employ a minimal amount of pre-processing. This means that, unlike traditional methods where these filters are hand-engineered, the network learns to optimise the filters (or kernels) through automatic learning.

This feature extraction's independence from prior information and human interaction is a significant benefit. Region Based Convolutional Neural Networks have been used for tracking objects from a drone-mounted camera, locating text in an image, and enabling object detection.

The features of all region proposals that have an IoU overlap of less than 0.3 with the ground truth bounding box are considered negatives for that class during training. The positives for that class are simply the features from the ground truth bounding boxes themselves. The authors incorporate a bounding-box regression step to learn corrections in the anticipated bounding box location and size to enhance localization performance.

CNNs take a different approach towards regularization: they take advantage of the hierarchical pattern in data and assemble patterns of increasing complexity using smaller and simpler patterns embossed in their filters. Therefore, on a scale of connectivity and complexity, CNNs are on the lower extremity.

IV. EXPERIMENTAL RESULTS AND DISCUSSION

A. *Image (RGB) Load*

The images of the plant leaf are captured through the camera, this image is in RGB (Red, Green, and Blue) form, a color transformation structure for the leaf image is created, and then an independent color space transformation for the color transformation structure is applied.

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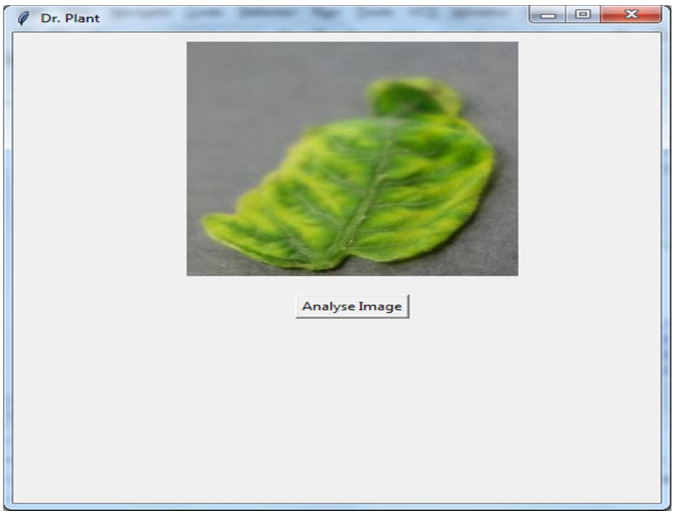


Fig. 2. Load leaf image

B. Pre-processing

To remove noise in the image object removal, the pre-processing technique is considered. Image clipping i.e. cropping of the leaf image to get the interested image region. Image smoothing is done using the smoothing filter. Image enhancement is carried out for increasing the contrast. The RGB images are into the grey images using color conversion using equation(x) =0.2989*R + 0.5870*G + 0.114*B Then the histogram equalization which distributes the intensities of the images is applied to the image to enhance the plant disease images. The cumulative distribution function is used to distribute intensity values.

C. Segmentation

Segmentation of leaf image is important while processing the image from that Segmentation means partitioning an image into various parts of the same features or having some similarity. The segmentation can be done using various methods like k-means clustering.

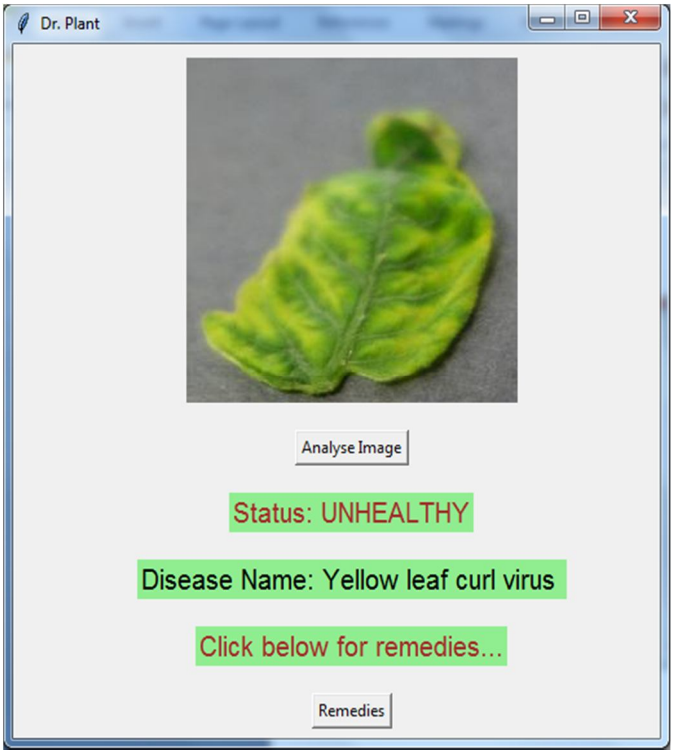


Fig. 3. Analyze the Image

D. Feature Extraction

Feature extraction plays an important role in the classification of an image. In many applications feature extraction of images is used. Color, texture, morphology, edges, etc. are the features that can be used in plant disease classification, texture means how the color is distributed in the image, the roughness, and the hardness of the image. This project considers color, texture, and morphology as a feature for disease detection. They have found that morphological result gives better result than the other features. It can use for identifying the infected plant leaf or of classification plant image.

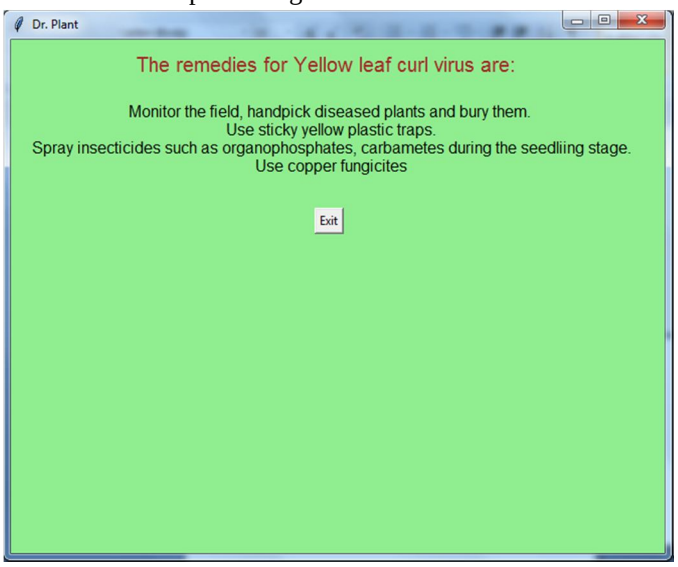


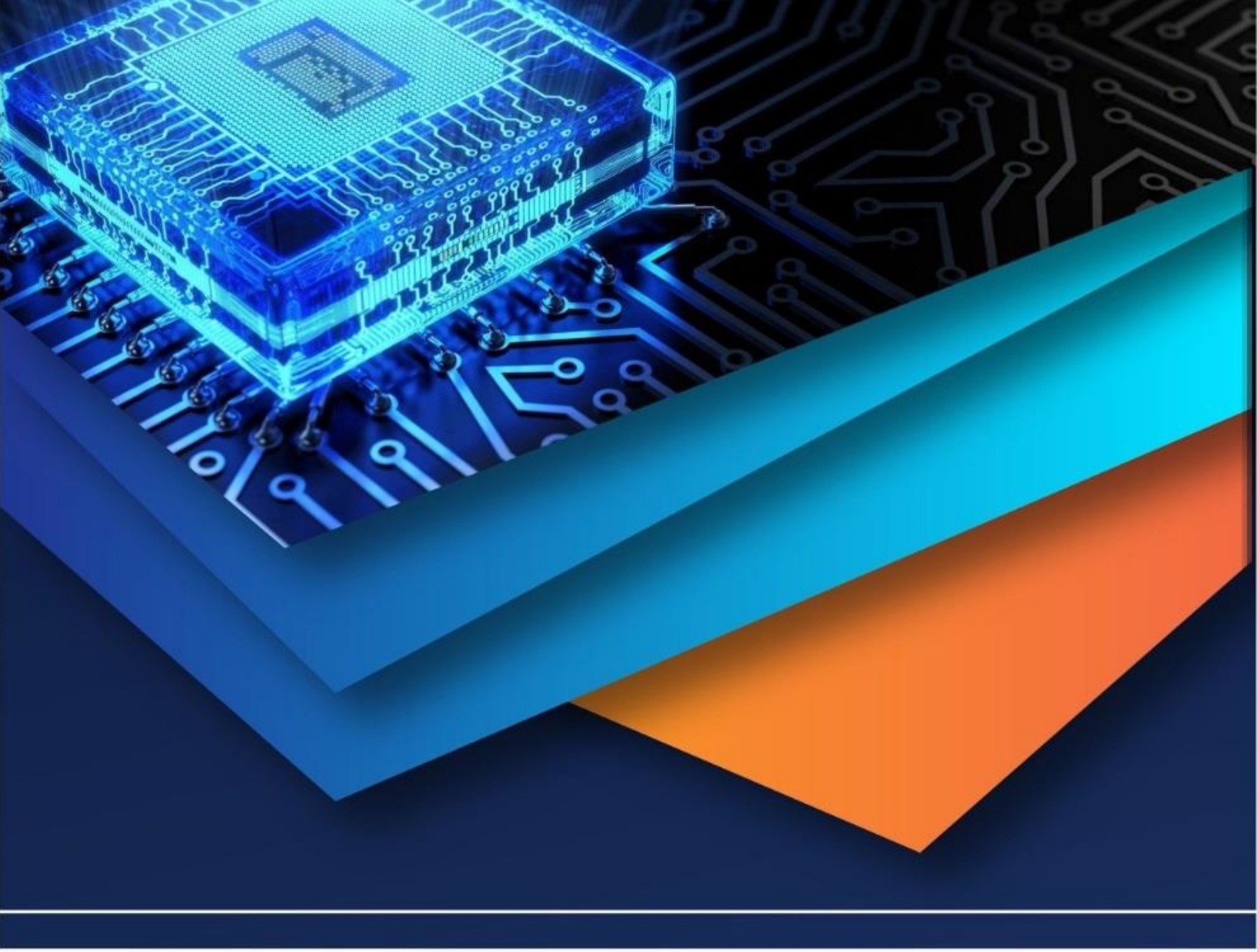
Fig. 4. Remedy for plant disease

V. CONCLUSION

For efficient crop cultivation, accurate disease detection and categorization of plant leaf images are crucial, and image processing can be used to accomplish this. In order to segment the sick part of the plant, many strategies were addressed in this research. The categorization of plant diseases using an SVM classifier and methods for identifying the characteristics of infected leaves were covered in this research.Before the problem of crop disease detection can be solved, the problems of identifying different species of plants need to be addressed. Fortunately, there has been much work already completed in this problem domain. Color features, such as the mean, standard deviation, skewness, and kurtosis are made on the pixel values of the various plant leaves and can analyze in the future.

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