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# DETECTION AND CLASSIFICATION OF LEAF DISEASE USING ARTIFICIAL NEURAL NETWORK

**Malvika Ranjan[1], Manasi Rajiv Weginwar[2], Neha Joshi[3], Prof. A.B. Ingole[4]**
SAE, Kondhwa, Dept. of E&TC. Engineering,
Pune, University, Pune, India
[1]malvikaranjan11@gmail.com, [2]manasiraj93@gmail.com, [3]nehajsh040@gmail.com, [4]abingole.sae@sinhgad.edu

***Abstract*— Farmers experience great difficulties in changing from one disease control policy to another. Relying on pure naked-eye observation to detect and classify diseases can be expensive. Various plant diseases pose a great threat to the agricultural sector by reducing the life of the plants. The present work is aimed to develop a simple disease detection system for cotton diseases. The symptoms of the attacks are usually distinguished through the leaves, stems or fruit inspection. This proposed system discusses the effective way used in performing detection of plant diseases through leaf feature inspection. Leaf image is captured and proposed to determine the health status of cotton plant.**

**Plant disease diagnosis is an art as well as science. The diagnosis process (i.e. recognition of symptoms and signs), is inherently visual and requires intuitive judgement as well as the use of scientific methods. The work begins with capturing the images. Color feature like HSV features are extracted from the result of segmentation and Artificial neural network (ANN) is then trained by choosing the feature values that could distinguish the healthy and diseased samples appropriately. Experimental results showed that classification performance by ANN taking feature set is better with an accuracy of 80%. The present work proposes a methodology for detecting cotton leaf diseases early and accurately, using diverse image processing techniques and artificial neural network (ANN).**

***Index Terms*—Artificial Neural Network(ANN), Hue saturation value features, Back propagation algorithm.**

## I. INTRODUCTION

Through our project we are going to make a system which will detect and classify cotton leaves diseases using Artificial Neural Network Technology. India was recognized as cradle of cotton industry. In Vidarbha(Maharashtra) region, cotton is the most important cash crop grown on an area of 13.00 lacks hectors with production of 27 lack bales of cotton (2008-09). Disease on the cotton is the main problem that decreases the productivity of the cotton. The main source for the disease is the leaf of the cotton plant. About 80 to 90 % of disease on the cotton plant is on its leaves. So for that our study of interest is the leaf of the cotton tree rather than whole cotton plant. The machine vision system now a day is normally consists of computer, digital camera and application software. Various kinds of algorithms are integrated in the application software.

We will take an input image of defected plant leaves and extract the features of leaves. In our project we will consider colour as feature. With the help of this feature we will compare our defected plant leaves with the database present there. We will use Artificial Neural Network as our classifier for comparision of cotton leaves. An **artificial neural network (ANN)**, usually called **neural network (NN)**, is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural networks. A neural network consists of an interconnected group of artificial neurons, and it processes information using aconnectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase.

We have created a database of diseased cotton leaf considering four diseases they are bacterial blight, cotton rust, fusarrium wilt and reddening of cotton. We have extracted the separate H, S and V features and compared those features with the features that are extracted from the input test image. We have perform various preprocessing steps on the input test image like grayscaling, thresholding, cropping for detecting the boundary of the image. We have divided the whole area of interest into blocks and the we have compared features of each block with the features of images in the database.

## II. PROPOSED SYSTEM

We proposed a system which helps in detecting the diseases of cotton leaves which will help the farmers to detect disease and take proper prevention to enhance the production of cotton.

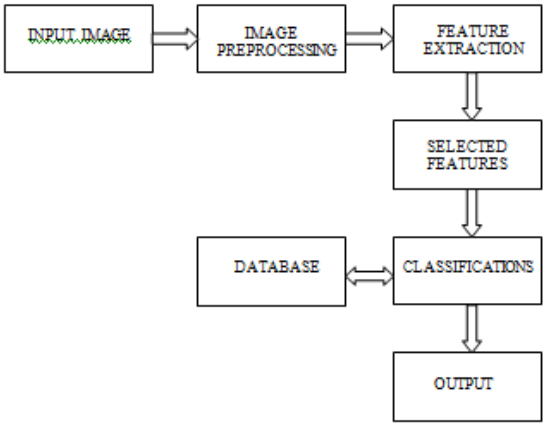
We took the pictures of diseased cotton leaves and performed various preprocessing techniques on them for removing the boundary of the leaf. The main target is to identify the disease in the leaf spot of the cotton crops. In this regard, It is discussed that about 80 to 90percentage disease on the Cotton crops are on its leaf spot. Consequently areas of interest is that identifying the leaf of the cotton rather than whole cotton.

We used ANN as the classifier for testing the input test image with the database image so that proper disease can be detected.

The main objective of the proposed work is to detect diseases in cotton leaves. It is very necessary to detect the diseases in cotton leaves. Detection of cotton leaf diseases can be done early and accurately using Artificial neural network.

## III. SYSTEM ARCHITECTURE

There are steps that we are going to use for cotton leaves disease detection. Firstly input image will be preprocessed and feature like color will be extracted. With the help of these features input image will be compared using ANN and disease will be detected.




It consists of following seven blocks. We started our project with the training of ANN for different diseases of cotton. Then we give features of input test image to ANN which compares that features with the features of database image and give us proper output.

**Creating Database:** We started our project by creating database used for training and testing by ANN. Database contains all the images of the cotton leaves that would be used for training and testing. The image database consists of image samples. The image database is responsible for the better efficiency of the classifier as it is which decides the robustness of the algorithm. For each of the disease we have taken some images of the cotton leaves and according to the features that are extracted from those images training of the ANN is done.

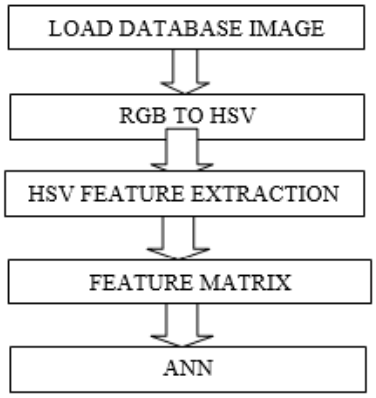
**Input Image**: In this any image of the cotton leaves in or outside of the database can be tested by the ANN that we have trained.

**Image Pre-processing**: Image pre-processing is the name for operations on images at the lowest level of abstraction whose aim is an improvement of the image data that suppress undesired distortions or enhances some image features important for further processing and analysis it task does not increase image information content.

**Feature Extraction:** The aim of this phase is to find and extract features that can be used to determine the meaning of a given sample. In our project we are considering color as desired feature. We will convert RGB image in hue saturation and value for getting features.

**Classification:** Classifier will compare the input image with diseased leaves present in database. We are using ANN as our classifier.

*A. Flow chart for database creation*




Apply to each pixel in the image.

A)Input image B)Filtered image

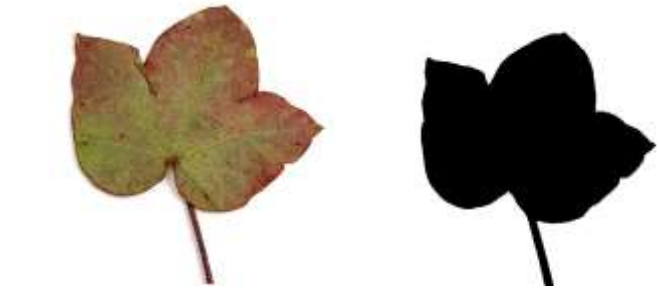
*B.RGB to Greyscaled Conversion*

- Traverse through entire input image array.
- *Read individual pixel color value (24-bit).*
- *Split the color value into individual R, G and B.*
- *Calculate the grayscale component (8-bit) forgiven R, G and B pixels using a conversion formula.*
- *Compose a 24-bit pixel value from 8-bit grayscale value.*
- *Store the new value at same location in output Image.*

A) Input image B) Greyscaled image

*C. Thresholding*

- Traverse through entire input image array.
- Read individual pixel color value (24-bit) and convert it into gray scale
- Calculate the binary output pixel value (black or white) based on current threshold.
- Store the new value at same location in output image.



A)Input image B)Thresholded image

*D.RGB to HSV*

Color objects in images can be easily described by its hue, saturation, and brightness. The HSV model decouples the intensity component from the color-carrying information in a color image. This model is an ideal tool for developing color image processing algorithms. The hue, saturation, and intensity values can be obtained from the RGB color cube. We can convert any RGB point to a corresponding point in the HSV color model by working out the geometrical formulas. For the images in the database for each image averaging is done for hue saturation and value and these are features are extracted by this method and the output is obtained simultaneously.

A) Input image

B) Hue

C)Saturation

D)Value

*E.Final Results*

Features of input image is extracted by converting RGB image in HSV and then different blocks are generated of size 10*10. We have assigned different colours to denote blocks of different diseases like red for Bacterial blight, green for Fussarium wilt, blue for Reddning and black for cotton rust. In output we are also showing the percentage of leaf area effected by disease. For that we are dividing blocks of disease effected area with total number of blocks present in image.



*F.Output table by consediring different test images*

| S.NO | TEST IMAGE/ DISEASES | FUSARIUM WILT | REDDNING | BACTERIAL BLIGHT | COTTON RUST | NORMAL |
|---|---|---|---|---|---|---|
| 1. | TEST IMAGE 1 | YES | NO | NO | NO | NO |
| 2. | TEST IMAGE 2 | YES | YES | NO | NO | NO |
| 3. | TEST IMAGE 3 | YES | YES | NO | NO | NO |
| 4. | TEST IMAGE 4 | YES | YES | YES | YES | NO |
| 5. | TEST IMAGE 5 | NO | NO | NO | NO | YES |

## V.CONCLUSION

Recognizing the disease is mainly the purpose of the proposed approach which can recognize the leaf diseases with little computational effort. This approach can be used for the agricultural applications like detection & classification of diseases of plant parts like leaf with suitable classifier .This project will describes a possible approach for extraction of low level image feature like color. This paper addresses how the disease analysis is possible for the cotton leaf diseases detection, the analysis of the various diseases present on the cotton leaves can be effectively detected in the early stage before it will damage the whole plant. The efficiency of the proposed work is about 80% and hence the model presented can able to detect the disease more accurately compare to the other classifiers.

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