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Plant Disease Classification Using Image Segmentation and Support Vector Machine

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Abstract: *Agriculture is having very special importance as it is the major source for food production. It is very important for farmers to maintain the good yield of crop. The healthy crop gives good production. But the crop yields can be affected with various kinds of diseases which can't be predicted manually because it takes large amount of time, which can affect the entire yield. To overcome this problem the computer based design is developed which helps to identify the disease easily and to maintain the good crop. Therefore the proposed process is of two sections in the first section the by using training samples knowledge base is created with the following steps that include image load, pre-processing, segmentation, feature extraction, SVM classification. In the second phase the detection of plant leaf disease is done by using trained model knowledge.*

Keywords: image pre-processing, segmentation, feature extraction, SVM classification, disease prediction.

1. INTRODUCTION

Weather can't be controlled by the farmers since they lost control of most farming practices. If the farm is full of a pest or a disease, it's to be corrected with immediate result with none delay. By observation of leaf we can know the disease of the plant. Farmers are not able to monitor the disease of the plant by manually and not able to tell the symptom of the plant they are going to apply approximate pesticides for the plant. However unremarkably the farmers aren't during a position to spot the particular un wellness deficiency. This leads to the applying of wrong plant food and eventually this leads to the effect of the crop and the soil. We need to modify the drawback to identify the disease of the plant. It can be completed by the assistance of various image process techniques.

There square measure is the several reasons for identifying the disease on leaves. Identification of the disease plays the important role in the project. Distinguishing plant disease is tried during this work. In Republic of India hour of the individuals pay their lives in agriculture. The cultivation can enhance the economy of the state since it's considering in concert of the most important class.

The improvement of agriculture technology it makes simple to detect the disease of the plant. By using the computer technology we identify the plant disease. The key to form appropriate analysis report for plant disease is very difficult by manually so by using the agriculture development it makes easy . The various diseases such as early blight and pink rot etc these diseases of the potato are very difficult is identify manually and it is a time consuming process to detect it manually and it also need high level of experience, some things experience also goes wrong and uses different pesticide which makes crop more effect , to detect the disease by manually by considering all theses factors and to overcome the problem the automatic detection of plant leaf disease makes easy. Diseases occur mostly due to the micro-organisms, fungus, virus, any genetic effects and bacteria. These disease effect the plant and production of the crop. Early detection of these diseases makes the plant healthy and gives good production. All theses are observed and studied by North America nation and implemented automatic detection of plant disease , by invention of this farmers profit increases, yield healthy crop with out damage, the productive also increases, it helps a lot of offering to the country. There are several methods to observe the plant disease occurred to the plant, many researchers found different techniques to identify the detective part of the leaf

which makes easy to identify the disease of the plant to the farmers.

CLASSIFICATION Agriculture has special importance in this it's a significant supply of food and, vesture and is a vital economic supply for countries. Agriculture is plagued by a range of things, organic phenomenon like diseases ensuing from bacterium, fungi, and viruses and non-biotic such as: water and, temperature and different environmental factors. Detection of those diseases need folks to consultants additionally to a collection of kit and it's costly in terms of your time and cash so, the event of a pc based mostly system helps the detection of the plants' diseases is extremely useful for farmers yet on specialists within the field of plant protection. The projected disease detection system consists of 2 phases, within the 1st section, the content is established by introducing a collection of coaching samples in a very series of process that embody 1st use pre-processing techniques like cropping, resizing, fuzzy bar chart deed, extracting a collection of color and texture options and accustomed nice the content that used as coaching information for support vector machine classifier. within the second section, we tend to use the classifier that was trained victimisation the content for detection and diagnosing of plant leaf diseases here square measure several diseases that have an effect on crops and cause important production losses, that threaten the problem of food security. Human visual examination with the eye is that the means most generally used and customary. This methodology offers an oversized area for error betting on wherever the farmers making an attempt to discover the sickness through visual review as a giant probability of error in some cases resorting to consultants, this latter wants loads of your time, effort and cash. Another downside in Asian nation, is that the foremost of the crop Fields square measure set in rural areas, that need farmers to travel long distances to seek out consultants .Image process offers accuracy, high-speed, don't need great amount of cash to and long as in brought knowledgeable.

The objectives of this work tells us the disease of the plant

(1) Converting the color image of disease leaf
(2) The pictures are segmented.
(3) By extracting the features like color, shape, texture.
(4) Classify and tell the disease of the leaf.

2. RELATED WORKS

The system was designed to identify the diseases on the tomato plant. This can be done by using deep learning technique. Four sides four camera are fixed to the tomato plant to identify the disease of the plant. It identify mainly the diseases like Target spot , Leaf miner, Phoma .The images of diseased plant and un diseased plant and trained by using neural networks.[1]The embedded systems are used for several purposes. Here they used VGA monitor to display the output and the detection is done using MATLAB. This mainly focus on Hevea leaves. [2]Owing to dynamic weather conditions, crops of 10 get affected as a result of that agricultural yield decreases. Our projected model provides associate automatic methodology to see plant disease in an exceedingly plant victimisation trained dataset of pomegranate leaf pictures.[3]By using this work the detection of plant disease is done by using colour image also uses feature analysis. Fuzzy ARTMAP is used to detect the grape diseases efficiently. By writing the data in matrix format we identify the disease of the plant. It helps the farmers to increase the productivity of the crop[4].This work mainly focus on pomegranate leaves. The check set is used to identify whether the leaf of the plant is healthy or not. If the leaf is not healthy it identify the disease of the plant by using image segmentation method .The system consists of 4 main phases pre-processing, segmentation, feature extraction and classification. [5]This work mainly focus on the diseases of the paddy leaf, this can be done by using image pre-processing and pattern recognition.[6]This is used for early detection of plant by extracting the important features of the leaf pictures. This planned system consists of a tool known as hound dog bone black; the Stages are pre-processing, segmentation, feature extraction and Classification.[7]The main aim of this work is to identify the diseases of the chilli plant. The diseased area of the chilli plant is identified by different image processing techniques and identify the diseased area of the plant. The unwanted images are removed by different pre-processing and filtering techniques, in this way they identify the diseased leaf.[8]The disease of pomegranate is identified in this paper. This identify the several diseases of pomegranate and tell the disease of the fruit this can be done by using Pre-processing and

morphological process and Image segmentation. It also classify the diseased images into grades depending upon their condition.[9]This work proposes the advanced techniques to detect and classify the disease of the plant. It is very difficult for farmers for continuous observation of plants and it takes a lot of time to detect the disease of the present in the plant. It also reduces the production of crop. The technologies involved in this paper are spectroscopic and image based, volatile profiling based plant disease detection.[10]This work identify the disease of the rice plant. The images of the rice plant are captured using digital camera and It is processed using image growing. The affected parts of the plant are detected by using image segmentation. After that classification is done by using neural network . The methods used in this paper are image processing and soft computing techniques.[11]The diseased leaf is identified using feature extraction .The main part in the paper is the feature extraction .The extracted features of the plants are helped to detect the disease of the plant. This paper proposed the technique for feature extraction and comprises the two techniques.[12]. This work mainly uses the back propagation technique. For doing weight adjustment they used Back propagation of training database that is given for this project. The diseases are classified based on the three features colour, texture, morphology.[13] This work supported monochrome segmentation approaches in operation in several color areas. the most important segmentation approaches for segmenting monochrome images: bar chart thresholding, characteristic feature bunch, edge detection, region-based strategies, fuzzy techniques, neural networks.[14] In this work cotton disease is identified .The color of the cotton leaf is varied based on the disease of the plant. The features of the plant are extracted using self organising feature map and also back propagation method is used and neural network Is used to detect the color of the image .In this way the disease of the plant is identified.[15] The proposed work is to detect the disease of the plant automatically. It involves four steps, Firstly the colour transmission is done, then the green pixels present are cleared using segmentation, this data is taken and divided into useful segments, finally the features extracted are passed in to the classifier . It identify the disease of the plant.[16]It is helpful to detect the disease of the plant by using the algorithm and classification is also performed. Therefore, it will take into account for fast, low price and precises.[17]

3. PROPOSED METHOD

SYSTEM BLOCK DIAGRAM

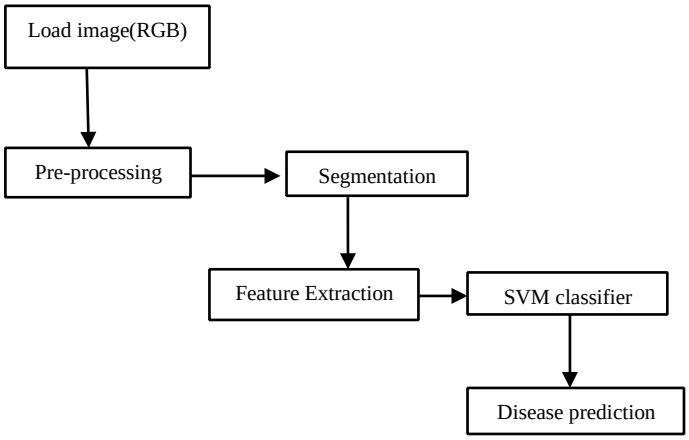

Fig-1: Block Diagram

ALGORITHM

Step 1: Load leaf image

Step 2: Contrast image gives accuracy of the affected image

Step 3: pre-processing

Step 4: segmentation identify the part of the effected area. The pixels are separated into two clusters. They are

1. To find the mean of every cluster.
2. The difference between two means should be squared.
3. Multiply the different pixels into one cluster instances based on the quantity in order.

Step5: feature extraction is become aware of the disease and morphological approach offer higher end result.

Step 6: SVM classify is built in method that can provide classified result

Step 7: The classified disease is predicted.

SVM(Support Vector Machine) The first a part of the projected disease detection system is that the method of coaching. At this stage, the pictures of the plants are obtained employing a photographic camera. After the pictures are taken we apply image pre-processing technique. once pre-processing, useful image options are extracted exploitation feature extraction technique which will be used as coaching samples for the support vector machine algorithmic program (the projected machine learning algorithmic program during this system). within the detection part, the pictures are obtained 1st by capturing them with a photographic camera. After that, the image process techniques observed within the coaching part are applied and eventually, the case are classified as either infected or healthy through support vector machine (SVM). it's a method aim to up the image and, configures it for later processes by removing noise and unwanted objects and up the visual appearance; it conjointly offers a positive impact on each the method of segmentation and options extraction and thus has a sway on the ultimate outputs of the system and accuracy.

4. SYSTEM METHODOLOGY

PROPOSED SYSTEM ARCHITECTURE

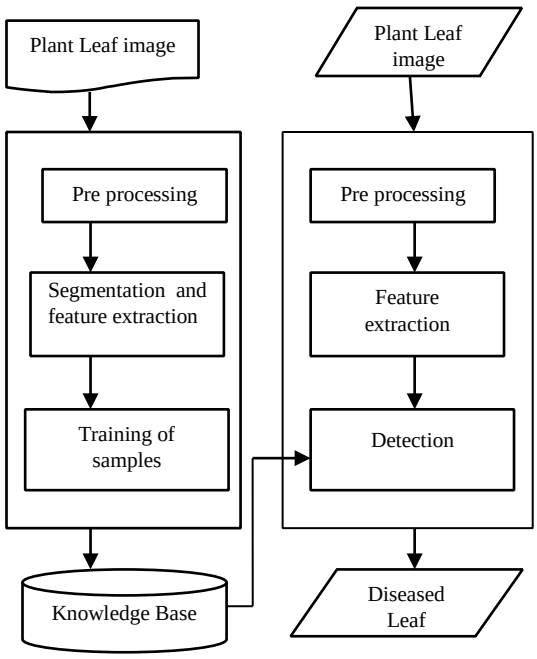

FIG-3: Proposed System Architecture

The first a part of the proposed disease detection system is that the process of coaching. Firstly the images taken by using digital camera. After the images are taken, image pre-processing is done to the images . In pre-processing the unwanted images are removed. After removing the unwanted images feature extraction is applied to the images in training data set. In the detection phase, the images will be obtained first by capturing them with a digital camera. After that, the image processing techniques referred to in the training phase will be applied and finally, the case will be classified as either infected or healthy through support vector machine (SVM).

Image (BGR) load: The images of leaf are captured by the camera which is in the form of BGR structure, shading change structure and autonomous shading space changes are made.

Pre-processing: Image pre-processing is used to identify the undesired distortions. The identified undesired distortions are removed and it also identify the images which have less brightness those leave images are taken and it improves the features of the image that is used for future process but it does not the content of the image. It should have 256*256 pixels of the image. Considerable redundancy in images are used by this method. Contiguous pixels equivalent to one real object have constant or similar brightness price. For example if it takes the distorted pixel from the images then it do the average of the pixels that are present in neighbour pixels. In proposed system image pre-processing is applied to the data stored in the image database that are captured before

SEGMENTATION: Image segmentation is used to separate the image of leaf from the background, the colour of the leaf is extracted from the image.

Feature extraction: Feature Extraction is an important stage that plays a main role in classification. It produces the tabular format after the feature extraction is done. The tabular format act as a input for the classification. By using the table classification is done. It tells the desired portion which is affected in the leaf. The basic characters of features extraction are colour, shape and texture.

Colour - Mean, Standard deviation, colour histogram

Shape- HU moments, Zernike moments

Texture- Haralick Texture, local binary

patterns

Support Vector Machine: In classification we use SVM to detect the disease of the plant. With the help of SVM we get 90% accuracy and can also be used for the large data sets.

Training the Detection System:

Identification of Patterns using a machine learning approach has two basic stages. In the first stage, the classifier is trained using the training samples to extract the weights. The system then examines the accuracy of the system using the test samples. Therefore, the total samples were to be divided into training samples and testing samples. In this study, we divided the total samples into 80% training and 20% testing. As it is shown in the Figure 4 from the total dataset (799 images) 80 % were used for training the SVM classifier and 20% used for testing. The same ratios were used in the division of disease samples for the diagnosis process.

Testing the detection system:

After the training is completed, the classifier will use 20% of the total samples accuracy is inspected using confusion matrix. Were accurately in detection the disease case 90.6.1% and the accuracy of detecting the healthy case 77.4 with average accuracy for the detection system 88.1% as shown in the figure 4. Accuracy (AC) is defined as the ratio of correct predictions (CP) to the total number of predictions which correct predictions $(CP) + false\ predictions(FP)$. The following equation will be used to calculate accuracy. $AC = CP/(CP + FP)$.

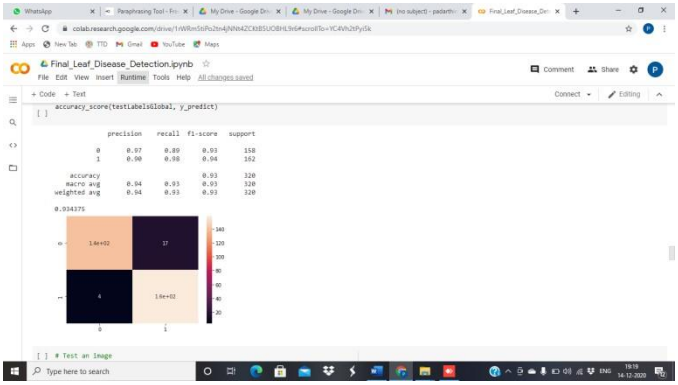

Fig-4: SVM disease detection confusion matrix

2. RESULTS

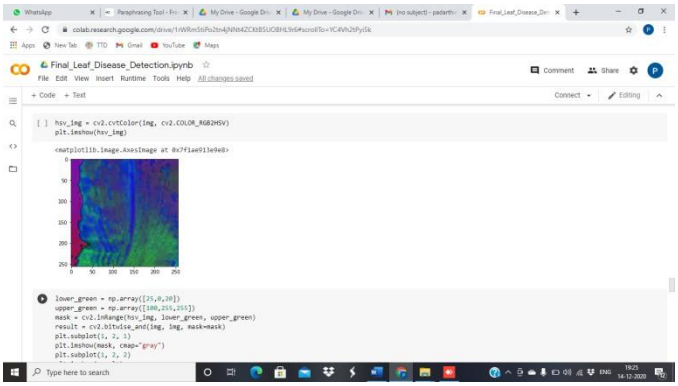

Fig-5: result of image processing

This fig 5 shows the result of the image processing in which the image is converted from RGB to HSV.

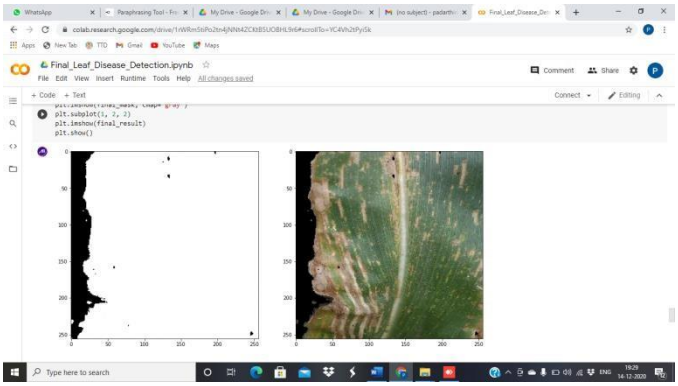

Fig-6: segmentation final result

This image shows the final output after performing segmentation based on upper green, lower green and upper brown, lower brown. The final result shows the name of the predicted disease and the image of the leaf with markings of the effected portions.

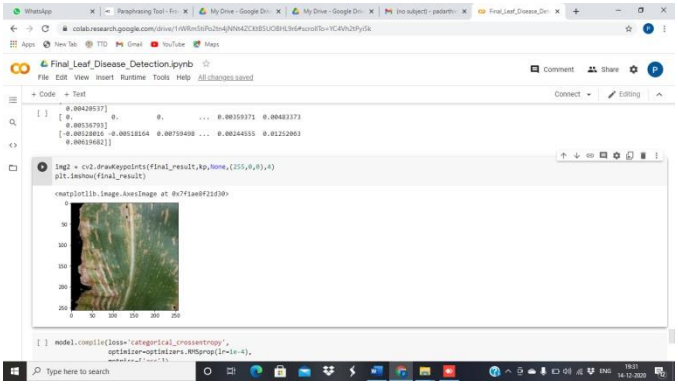

Fig-7: Final output of the leaf image

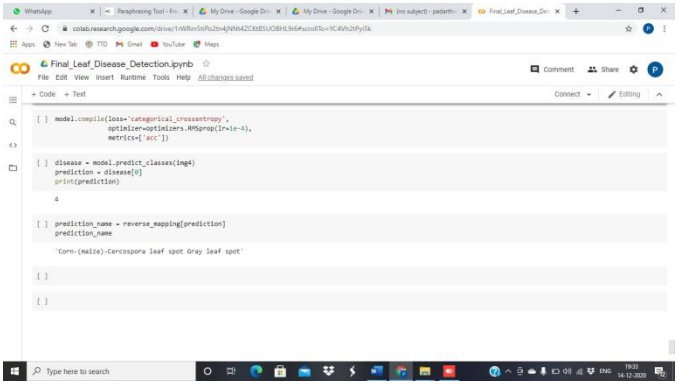

Fig-7: Predicted leaf disease name

By using SVM technique we get 90% accuracy .The main objective to use SVM it support for large dataset.

5. CONCLUSIONS

It was concluded that the plant leaf detection was very accurate, and the accuracy range will be increased as the no of training samples increase. And also the change in the SVM settings will effect on accuracy percentage. The extracted features are used to perform classification and find the name of the affected disease. The crop production increases and we get good quality crop. Database is randomly divided as training and testing vectors. The two feature vectors are used to get the graph for SVM classification. The classification is done after training the classifier by the training vectors

Future Scope: Identification of plant disease helps to increase the productive of crop it is difficult to detect manually the disease present in the plant by using this it is very easy.

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