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CROP DISEASE DETECTION

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Abstract - *Plants play an essential role in climate change, the agriculture industry and a country's economy. Thereby taking care of plants is very crucial. Just like humans, plants are affected by several diseases caused by bacteria, fungi and viruses. Identification of these diseases timely and curing them is essential to prevent the whole plant from destruction. This project describes leaf disease detection using image processing that can recognize problems in crops from images, based on color, texture and shape to automatically detect diseases and give fast and accurate solutions to the farmer using CNN (Convolution Neural Network) & ANN (Artificial Neural Network). Different classifiers are used to classify such as SVM (Support Vector Machine), K- nearest neighbor classifiers, Fuzzy Logic, etc. This project imparts a representation of leaf disease detection employing image processing that can identify drawbacks in plants from images, based on color, bound and texture to give brisk and reliable results to the farmer.*

Key Words: ***CNN (Convolution Neural Network) & ANN (Artificial Neural Network), SVM (Support Vector Machine), RGB (Red Green Blue),***

1.INTRODUCTION

In India, about 70% of the population depends on agriculture. Due to production losses, many farmers attempt to commit suicide, which is a painful problem. This problem can be controlled to some extent by using new technologies that will help farmers improve the harvest. Many farmers want to adopt modern agriculture, but they cannot due to a number of reasons such as lack of awareness of latest technology, high cost of technology, etc. It has been repeatedly observed that foliar diseases are difficult to control because populations change with environmental conditions. Plants are often affected by various diseases such as leaf spot, drought, color change, etc. and some can destroy entire cultures if not diagnosed and treated promptly. This can lead to huge losses for farmers and can also lead to lower yields of staple crops leading to higher prices and burden on the economy. The major challenges of sustainable development are reducing the use of pesticides, preserving the environment and increasing quality.

1.1 Objective

Our work mainly focuses on critical analysis of various plant disease segmentation techniques using an image processing based deep learning model known as a crop disease detector.

- Detect some plant diseases using pictures of their leaves.
- Classification of leaf diseases using structural features.
- Coding used to analyze leaf infection.

1.2 Problem Definition

The ability to diagnose plant diseases is limited by human visual ability because most of the initial symptoms are microscopic.

- This process is tedious and time consuming. There is a need for a system designed to automatically recognize, classify and detect symptoms of crop diseases. In plant disease, disease is referred to as any alteration of the normal physiological function of plants, producing characteristic symptoms.
- Automated foliar disease detection is important as it can be useful in monitoring large crop fields, and thus automatically detecting disease from symptoms appearing on the leaves of plants. Here, image processing plays an important role. The system provides the ability to capture images, process and receive results through image processing.

1.3 Future Scope

By using different new technologies and methods, we need to make the application faster and more efficient for the users.

- The system presented in this project should be able to function correctly, based on the development of an automated and accurate model used to detect leaf diseases.

• Work could be extended to developing an artificial vision system that automatically recognizes, classifies and detects symptoms of leaf disease.

2. LITERATURE SURVEY

Mrunalini R. Badnakhe and Prashant R. Deshmukh by using the automated agricultural inspection, Farmer can give potentially better and accurate productivity. The different products can be yield with better quality. The primary need for the agriculture to predict which the infected crop is. With the help of this work we are indirectly contributing for the Improvement of the Crop Quality. It is a Machine learning based recognition system which will going to help in the Indian Economy. The paper will propose the technique to classify and identify the different disease affected plant. Digital Analysis of crop color is the important. Now it's becoming popular day by day. It is also of the cost effective method. Because changed in the color are a valuable indicator of crop health and efficiency and survaibility. Then it can be measured with visual scales and inexpensive crop color.

S.Raj Kumar , S.Sowrirajan The proposed decision making system utilizes image content characterization and supervised classifier Back Propagation with Feed Forward neural network (BPN-FF). At the preprocessing stage, the resizing of image to 256x256 pixels, color space conversion and region of interest selection is performed on an input image. Color, texture and geometric features of the image are extracted by the HSV conversion, GLCM, Lloyd's clustering respectively. The proposed method incorporates all the hybrid features with the aid of Lloyd's Clustering and BPN-FF classifier will be used for classification based on learning with the training samples and thereby providing the information.

Vidyashanakara and Kumar, 2018[3] classify leaves using the Gray Level Co-Occurrence Matrix (GLCM) to extract features based on the leaves and the Support Vector Machine (SVM) are used to improve the accuracy of the leaf classification. Muchtar and Cahyani,2018[4], researched the classification of leaves using image processing.

Huntley, B. (1991). How plants respond to climate change: migration rates, individualism and the consequences for plant communities. Annals of Botany, 15-22. The magnitude of climate changes forecast for the next century is comparable to the magnitude of warming during the last deglaciation. No climate change of similar magnitude has occurred since that event. The palaeoecological evidence of the response, especially of plants, to past climate change indicates that evolutionary adaptation has played no more than a minor role and that migration is the usual response of organisms to climate change. The individualism of response has important implications with respect to changes in the nature of vegetation and ecosystems. The maximum realized rates of migratory response by trees, although perhaps matching the maximum potential rates, are close to the maximum that it is believed can be achieved by such long-lived sessile organisms.

Fang, Y., & Ramasamy, R. P. (2015). Current and prospective methods for plant disease detection. Biosensors, 5(3), 537-561.Food losses due to crop infections from pathogens such as bacteria, viruses and fungi are persistent issues in agriculture for centuries across the globe. In order to minimize the disease induced damage in crops during growth, harvest and postharvest processing, as well as to maximize productivity and ensure agricultural sustainability, advanced disease detection and prevention in crops are imperative. This paper reviews the direct and indirect disease identification methods currently used in agriculture. Laboratory-based techniques such as polymerase chain reaction (PCR), immunofluorescence (IF), fluorescence in-situ hybridization (FISH), enzyme-linked immunosorbent assay (ELISA), flow cytometry (FCM) and gas chromatography-mass spectrometry (GC-MS) are some of the direct detection methods. Indirect methods include thermography, fluorescence imaging and hyperspectral techniques. Finally, the review also provides a comprehensive overview of biosensors based on highly selective bio-recognition elements such as enzyme, antibody, DNA/RNA and bacteriophage as a new tool for the early identification of crop diseases.

3. METHODOLOGY

Plant diseases are of great concern to today's farmers. Farmers often do not know which pesticide is needed to treat a crop with a particular disease because they do not know the nature of the disease. This causes the wrong pesticides to be applied, damaging the crop and affecting the yield of the crop. To solve this problem, we have found a solution to develop a system that can easily identify common diseases that occur in plants

These illnesses are:

•Early rot

• Bacterial spots

• TYLCV

Using image processing and machine learning algorithms to classify such diseases and create models that provide an easy and accurate way to determine plant diseases. Image of leaves of affected plants. This system is beneficial for farmers as it not only saves crops, but also saves money simply by purchasing the right type of pesticide for the treatment of the disease at hand. The system works without heavy machinery or heavy usage of electricity, so it has proven to be an environmentally friendly solution as well as cost-effective.

A. Goals of Machine Learning Model.

With the right pesticides and remedies, we can reduce pest attacks. We can use appropriate resizing techniques to reduce the size of the image so that the quality does not deteriorate excessively. The project mentioned above can also be extended to show cures for illnesses from the system. The main goal is to use image processing to identify plant diseases. Also, after identifying the disease, the name of the pesticide to be used is suggested. It also identifies the insects and pests that cause the epidemic. Complete each process one at a time and reach each output.

Therefore, the main goals are:

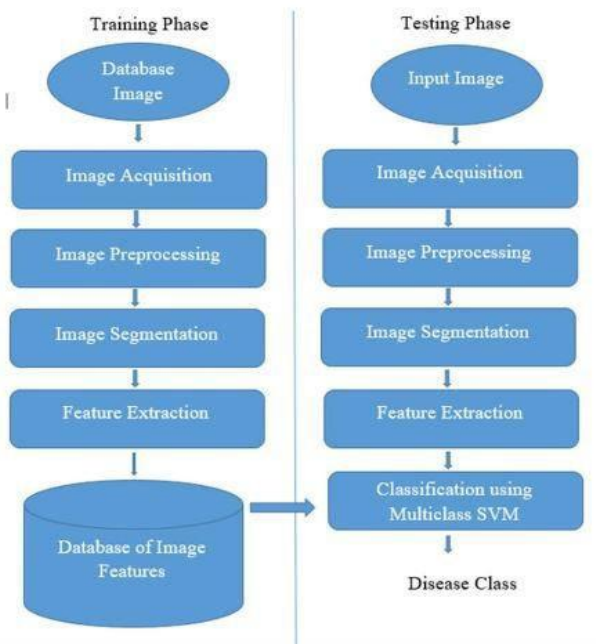
1) Develop a system that can accurately detect plant diseases and pests.

2) Creating a database of pesticides for each pest and disease.

3) Create a cure for the diagnosed illness.

B. Design of Model.

In order to build a machine learning model the figure consists of two phase namely testing and training phase where the model is first trained and an input is given to test the model which is called the test data. The model consists of several image processing steps such as image acquisition, image pre-processing, segmentation, feature extraction and SVM classifier to classify the diseases.



C. Algorithm

1. Capture images in RGB format.

2. Creation of color conversion structure

3.Convert color values to designated rooms in this structure from RGB.

4. Applying K means clustering of image segmentation.

5. Masking Green Pixel (Masking Green Channel).

6. Eliminate masked cells present at the end of the infected cluster.

7. Convert infected clusters from RGB to HIS.

8. Generation of SGDM Matrix for H and S

9. Calling the GLCM function to calculate its characteristics.

Detection of diseases using the K clustering method. This algorithm provides the necessary steps required for image recognition of the plant sheet. In the first step, RGB images of all leaves are usually recorded at the camera. In step 2, a color conversion structure is formed, and then color space conversion is applied in step 3. These two steps are expected to perform step 4. In this step, the received image is processed for segmentation using the K-Means clustering technique. These four steps fall into Phase 1 where infected objects are detected and determined. In step 5, the green pixel is detected. Next, the masking of green pixels is done as follows: If the green color value of a pixel is less than the threshold already calculated, the red, green, and blue component values of those pixels are zero. This happens because this is the unaffected part. That's why their values are made zero, which also leads to a reduction of calculations. In addition, the time consumed by the system to render the final result will be greatly reduced. In step 6, pixels with no values for red, green, and blue, and pixels at the edges of infected clusters, are completely discarded. Stage 2 includes step five and step number six and these results with good detectability and good performance, as well as the overall required computation time should be reduced to its minimum value. In step 7, the infected cluster is converted from RGB to HSI format. Then, an SGDM matrix is generated for each pixel in the image. But this is only done for H and S frames and not for I frames. SGDM actually measures the probability that a given pixel at a particular gray level occurs at a distance and angular direction d. than another pixel, but that pixel has a special second gray level for it. From the SGDM matrix, the generation of texture statistics for each image is performed. Briefly, features are calculated for pixels inside the edge of the infected part of the leaf. This means that the unaffected part within the boundary of the infected part will not participate. Steps seven through ten belong to stage three. During this phase, the texture-related features of the segmented objects are calculated. Finally, the accreditation process of the fourth phase has been implemented. For each image we capture, the steps of the algorithm are repeated each time. The result is then transferred to the GSM module. By using a good system, the results are emailed and also displayed on the screen.

D. Feature Extraction

We need to extract features from the input image. To do this, instead of selecting the entire set of pixels, we can select only those pixels that are necessary and sufficient to describe the entire segment. Affected areas are revealed. The percentage of area occupied by this segment indicates the quality of the result. A histogram of an object or image provides information about the frequency of occurrence of a particular value in any data/image. It is an important tool for frequency analysis. Coincidence takes this analysis to the next level. Here the matrix shows the intensity matches of two pixels together, making coincidences a great tool for analysis. Features such as contrast, correlation, energy, and homogeneity are extracted from the Gray-co-matrix.

E. Classification using SVM

Support vector machines are part of supervised learning models in machine learning. SVM is mainly used for classification and regression analysis. To get the output, we need to associate the SVM with the learning algorithm. SVM performs better for classification and regression than other processes. The

training kit is divided into two categories. The SVM learning algorithm creates a model that assigns new examples to one category or another, making it a non-stochastic binary linear classifier. The example occurs because views in SVM show and also display points in space, separated by the widest possible spacing

F. SYSTEM REQUIREMENTS

1) HARDWARE:

System : Pentium IV 2.4 GHz.

Hard Disk : 40 GB.

Monitor : 15 VGA Colour.

Mouse : Logitech.

Ram : 512 Mb

2) SOFTWARE:

Operating system: Windows XP/ Windows 7 or More

Software Tool : Open CV.

Coding Language: Python.

Toolbox : Image processing toolbox.

3) Functional Requirements:

The Software must be able to detect disease in leaf.

It should be able to extract texture features of the leaves.

It should display disease name.

It should display Remedy Name.

4) Non-Functional Requirements

Detection of Disease must be accurate.

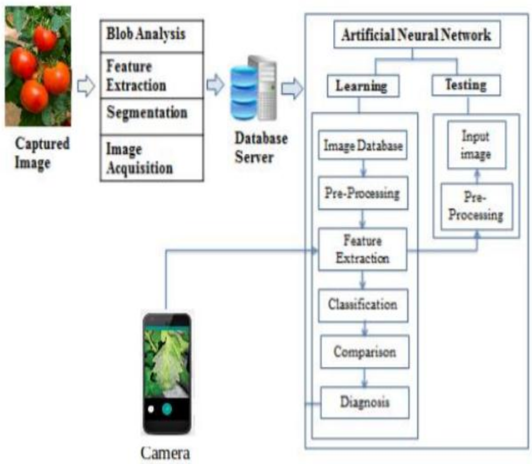
The detection process should be done effectively and efficiently.

The software should never fail in middle of the operation.

4. PROJECT DESIGN

A. System Architecture

This architecture shows how systems interact and control the flow from one point to another in a cycle. System hardware control flow from image capture to disease detection and display. The figure below shows the hardware and software control flow of the entire system.



B. Image Capture:

Leaf images of diseased plants are captured using a mobile or digital camera. The captured image is then sent to the system, followed by a process that includes image processing steps. The resulting image serves as input to this software system. These images constitute the test data that determines the accuracy of the system. Before we actually test it on our machine learning model, we first resize the image, then we use a variety of techniques to repaint and fit it. This image is ready to be tested.

C. Collecting and creating data sets

The dataset is a huge collection of raw data that must be trained to extract useful information. The dataset used in our system is a set of leaf images of various plants that fall into either healthy or diseased categories.

1. Early Blight
2. Bacterial Spot
3. TYLCV

To ensure that our disease identification model is as accurate and accurate as possible, the database must be huge. A total of 200 leaf images are required. 50 each for Health, Premature Decay, Bacterial Spot, and TYLCV. All these images need to be scaled and corrected to one specific quality and size to have a single data set. This dataset forms the training data that controls the platform, starting with the digital imaging part.

D. *Digital Image Processing*.

This is an overall large mechanism consisting of various steps and algorithms. Looking at the whole process as a whole, the functions of this stage are:

1. Perform training on images pre-configured and collected and saved as data sets.

2. Test the photos of the plant leaves we got to see if the leaves are diseased or not. The collected data set forms the training data trained by the image processing model. Then save this model and use it to check the images captured by the camera.

The web UI is needed when the user needs to upload captured images to the front-end and the UI is pre-trained with an image dataset in the back-end. Results are generated in the user interface and the user does not have to navigate between the training and testing phases of the system. The interface provides a simple and seamless flow of control and users do not need to know the entire mechanism behind the plant disease identification system.

5. CONCLUSION

This project uses classification of leaf images to identify the diseases of the sheet by combining texture and color functions. Initially, farmers send a digital image of patients with leaves of plants, and this image is read from Python and is automatically processed based on SVM. The results are displayed.

Results of this project - Find the appropriate features that can identify the disease of leaves of specific commonly generated plant diseases. The proposed approach is a valuable approach to supporting the exact detection of the leaf disease in a small amount of computing efforts by supporting vector classifiers for increasing the reference speed of the final classification process.

Further, only the amount of pesticide needed to effectively manufacture agricultural production system costs using severity and number of diseases present in crops.

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