A NOVEL APPROACH ON DISEASE AND SEVERITY DETECTION OF CROP AND PRDEICTION OF PESTICIDES USING MATLAB

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Abstract—*Identification of plant diseases is important to avoid losses in yield and quantity of agricultural products. The study of plant diseases means the study of blind specimens found on the plant. Health monitoring and disease detection at plants is important for sustainable agriculture. Plant diseases are very difficult to monitor manually. It requires tremendous work, plant disease expertise and even high processing time. Therefore, image processing is used to detect plant diseases. Diagnosis includes stages such as image acquisition, image pre-processing, image segmentation, feature extraction, and classification. These methods are discussed in this paper detection of plant diseases using images of their leaves. Some segmentation and characteristic extraction algorithms used to detect plant disease are also discussed in this paper..*

Key words- Deep learning, KNN, Plant diseases detection.

I. INTRODUCTION

The Indian economy depends on agricultural production. More than 70% of rural households are dependent on agriculture. Agriculture accounts for about 17% of total GDP [1] and provides employment to more than 60% of the population. Therefore the detection of plant diseases plays an important role in the agricultural field. Indian agriculture is made up of many crops such as rice, wheat. Indian farmers also grow sugarcane, seed oil, potatoes and non-food items such as coffee, tea, cotton, rubber. All these plants grow in strength of leaves and roots. There are factors that lead to various plant leaf diseases, which damage the plants and will eventually affect the world economy. This significant loss can be avoided by early detection of plant diseases. Accurate diagnosis of plant diseases is needed to strengthen the agricultural sector and our country's economy. Various diseases kill the leaves on the plant. Farmers find it very difficult to identify these diseases, which they are unable to detect in those crops due to lack of knowledge about those diseases. Biomedical is one of the fields for diagnosing plant diseases. Nowadays in the middle of this field, photo processing methods are suitable, efficient and reliable field for diagnosing diseases with the help of images of plant leaves. Farmers need quick and effective methods to diagnose all time-saving plant diseases. These programs can reduce efforts and the use of pesticides. In order to measure agricultural yields different ideas are suggested by scientists with the help of laboratory and plant diagnostic programs. The paper we have presented here researches different types of plant diseases and disease diagnostic techniques by different researchers.

Objective

The main objective of this project is to design a software tool to identify the crop disease by processing its leaf image, sending it to arboriculturist and receiving remedies. The underlying objectives are explained as follows:

i. To apply image processing techniques to obtain affected portion of the crop and extraction of consequential feature values.
ii. To perform comparison of extracted values with sample values to identify and classify the disease using various classifier algorithms.
iii. To integrate and compare results of various classifier algorithms.
iv. To predict the necessary control measures to cure the disease without any environmental and economic damage.

II. LITERATURE SURVEY

Yuanyuan Shao [16] discussed many features and genetic algorithm BP neural network. The Otsu method is used for partitioning and subtraction. According to real-time tobacco disease can be detected by the mobile customer and the server can make diagnoses of user-downloaded diseases. Here Otsu's method was used to rule out the local disease. The genetic algorithm can reduce training times and improve

visual accuracy. Further research is needed to determine the cause of tobacco use and to improve accuracy.

Vijai Singh [17] introduced an algorithm for the separation of the image of a leaf of a plant. The author proposed image recognition and segmentation process. First, devices were used to take a picture of various types and a different separate method was used to process the image. The author took a picture of the size m * n & all pixels with objects R, G, B. The color rendering method was used to extract the element. The above tests were performed at MATLAB. The author shows the effects only on beans, leaf, lemon and banana leaf. Further research is needed on all types of leaves.

Shanwen Zhang [18] is proposed to diagnose cucumber leaf disease. Due to the unusual shape, complexity, the existing shadows are not ready to be detected. From the image of the leaf, the Author has suggested a method that uses mixed textures and color elements. The author performed a regional separation from a sick image using the K-means clustering algorithm. The first system can collect images from a data set. Picturethey change from Red, Green, space Blue to Luminance * a * b * color model. Then separate the color using a combination of kmeans. Here each image is processed using sliding, enhancement, denoising, alignment and divided by k-means integration techniques.

Amar Kumar Dey [19] used an image processing algorithm with betel vine to diagnose leaf rot. They suggest a theory-based approach to detecting and identifying features of endemic diseases. Depending on the color factor of the rotting of the leaves it indicates. The author chooses the Bangla desi varieties of betel grape. They used a cannon scanner with 300 PPI resolutions to detect. The severity of the leaf disease can be identified as the universal calculation of the leaf area and the diseased area. The author has used Otsu's method of distinguishing leaf rot diseases.

III. PROPOSED METHODOLOGY

In methodology, the basic steps for plant disease detection and classification using image processing are shown (Fig. 1)).

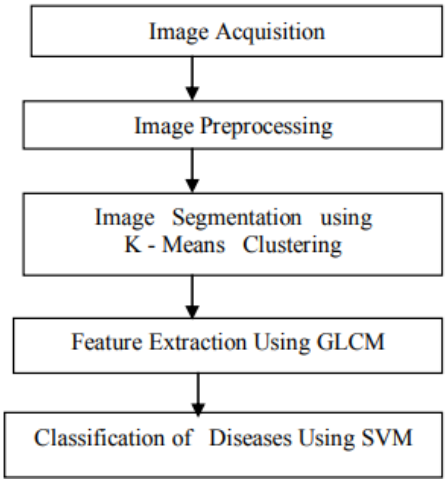

Figure 1 – Overview of the proposed Method

Image Acquisition

First, images of various leaves are captured using a digital camera with the required resolution of the best quality. The input image has been updated to 256x256 pixels. The creation of a database depends on the application required. The image website should be carefully constructed because it usually determines the efficiency of the partition and the performance of the proposed method.

Image Pre-Processing

Images in the database have a different and different background light that affects the accuracy of the application. Pre-image processing is important for sound removal and image separation which helps to improve the accuracy of the KNN model. Distinction is made that produces only the right part of the image. Therefore, after performing the classification all images of leaves with a dark background are available. In addition, managing isolated lighting lighting conditions has been converted to gray images and is being transferred to further development.Pre-processed images are reduced image size and image crop to a given input. It processes and enhances the image to its needed color scale.Pre-image processing is used to improve the image quality required for further processing and processing. Includes color space adjustment and image enhancement. RGB leaf images are converted to L * a * b * color space. Color modification is done to determine the light layers and chromaticity. Color space conversion is used for the development of visual analysis.

Image Segmentation

Image segmentation is the process used to simplify therepresentation of an image into meaningful form, such as tohighlight object of interest from background. The K-

meansclustering algorithm performs segmentation by minimizing thesum of squares of distances between the image intensities andthe cluster centroids. K-means clustering algorithm, or Lloyd'salgorithm, is an iterative algorithm that partitions the data andassigns n observations to precisely one of k clusters defined bycentroids.

The steps in the algorithm are given below.

1) Choose k initial cluster centers (centroid).
2) Compute point-to-cluster-centroid distances of allobservations to each centroid.
3) Assign each observation to the cluster with the closestcentroid.
4) Compute the mean of the observations in each clusterto obtain k new centroid locations.
5) Repeat steps 2 through 4 until there is no change inthe cluster assignments or the maximum number ofiterations is reached.

Feature Extraction

After splitting, the GLCM features are extract from the image. The Gray-Level Co-Occurrence Matrix (GLCM) is a mathematical method of investigating texture that looks at the pixel-local relationships [15]. GLCM functions define image formation by incorporating spatial relationships between pixels in images. Mathematical steps are extracted from this matrix. In creating GLCMs, a list of descriptions that define the directional pixel relationship with a different distance will be specified. In this proposed approach, four elements are extracted which include brightness, strength, similarity and integration. Let Pij represent input (i, j) in the standard Gray-Level CoOccurrence Matrix. N represents the number of different gray levels in the measured image.

SVM (Support Vector Machine)

Support Vector Machine is a kernel-based supervised learning algorithm used as a classification tool. The SVM training algorithm increases the gap between training data and class boundaries. Paid decision work depends only on training data called support veggies, which are very close to the decision boundary. It works best in a large size area where the size of the size is greater than the training data number. SVM converts data from input space to high-level space using kernel function. Nonlinear data can also be separated using a hyper plane at a higher size. Computer complexity is reduced by the kernel Hilbert space (RKHS).

Basically a straightforward model of reversal and segregation problems. It can find a solution to both direct and indirect problems and works well with many functional problems. The SVM method is like this: the algorithm develops a line or hyper plane that divides the data into many different categories. On the first scale what you do is find a line (or hyper plane) that separates the data of those two categories.

The supporting vectors of those data points are very close to the hyperplane and influence the position and position of this hyper plane. Using supporting vectors, we try to enlarge the dividing line. When you remove these support vectors, the position of the hyper plane will change.

Classification Of The Disease

The classification of the disease is done in two steps in which the first step is to determine the type of crop and the second step is to determine the type of disease. To perform these tasks using convolutional neural networks. Learning transfer is used to build a deeper learning model and is trained using the ImageNet database. Learning transfer is a form of machine learning in which a model is trained in one task and transferred to another related task. It is a method by which pre-trained neural networks are used to construct neural

network with the same type of work to incorporate faster and more stable problem-solving progress. These imaginative networks are built with training on large databases that contain a very large number of different images. Several research organizations are developing such types of models that take weeks to train with the latest high-end hardware. This is issued under a permitted license for direct re-use to create a new problem-solving model. These previously trained types can be optimized using a new database, if its nature is similar to the database in which the network is trained. In such cases the training is only trained in the last layer of the network, the set network can be used directly to solve the problem. If the database size is large enough the previously trained model can be re-trained using the new data again, in that casecase, the neural network is initiated by the weights of the selected model.

IV. DIFFERENET TYPES OF DISEASE IN PLANTS

The reason for this section is that researchers can understand the type of image processing activity and the type of factor that needs to be considered in terms of various diseases.In plant diseases that occur when a virus is present, bacteria infect the plant and disrupt its normal growth. The effect on the leaves of plants can vary from discoloration to death. Causes of diseases due to fungal infections, germs, viruses, nematodes. Here we discuss some common diseases in Maize, peanuts, coconut trees, Papaya, Cotton, Chilli, Tomato, Brinjal. Pictures of plant disease. Several variations of diseases are described continuously.

Rust: It is usually found on the leaves in the lower parts of mature plants. Initially the areas under the leaves are raised. Over time these spots become reddishorange spore mass.

Later, the leaf postules turn green and eventually black. A strong infection will bend and dislodge the leaves and cause the leaves to fall off [2].

Kole Roga: It is a major arecanut disease. The pathogen is the fungus Phytophthora palmivora [3].

Yellow leaf disease: The disease is caused by the pathogen Phytoplasma in arecanut where the green leaves turn yellow which gradually decreases in yield.

Leaf rot: Caused by a coconut tree. It is caused by mold or bacteria. Leaf area varies in size, shape and color [4].

Leaf curl: Diseases are characterized by a leaf curl. It can cause a fungus, a type of Taphrina or a virus [5].

Angular stain: Many cotton plants die from the disease because they come from the leaves first and then the water is wet. Eventually turn black and make holes in the leaves [6].

Leaf area: A serious bacterial infection found in chili is spread by Xanthomonas campestris pv vesicatoria [7]. Symptoms such as small yellow-green patches and spots on the leaves.

Late Blight: Late Blight spreads quickly. Development of the fungus due to Cool and moist weather. It forms abnormally formed ashes on the leaves. In the surrounding area there will be a white mold ring [8].

Bacterial withering: Brinjal planting yields decrease due to bacterial wilting. The whole plant has fallen to the ground due to the withered leaves [9].

V. DISCUSSION AND CONCLUSION

There are two different types of training and testing. One is under the conditions of the lab, that isthe model is tested with images from the same database where it is used for training and testing.Another situation is that of the field; this means that our model tested with images taken inconditions of the real world (earth). As the lighting conditions and backgrounds of the images arecompletely different when we take samples in the real field, there is a chance that our model will produce much lower accuracy, compared to the accuracy values obtained between web conditions. To overcome this effect, we had the idea of having a variety of images integrated during training (heterogeneity).

VI. EXPECTED OUTCOMES

The software tool determines the affected region of the image and extracts the consequential values and compares them with sample data to determine and classify the disease associated with the crop and predicts the necessary control measures. Further it also compares and analyze the outcome of various classifier algorithms.

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