

Leaf Disease Detection Using Image Processing and Machine Learning

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Abstract— In development of India agriculture is the major economic factor. Indian people are highly dependent on agriculture. In agriculture disease detection is one of the most important factors huge times as well as skilled labour are also required. As we know the agricultural sector plays an important role in the economy of a country, as there are many different varieties of crops available to farmers. However, difficulties occur when the crops get infected by some kind of disease, and the farmers are not informed of the disease at the correct moment. Farmers do not know what disease they are dealing with when they detect the disease. For this reason, the study of leaf disease detection in agriculture is a fundamental subject of study as it could prove useful in the observation of vast fields of crops. In this paper we are going to detect the different diseases occurring on plants using image processing and machine learning. In image processing there several steps to determined diseases such as image collection, image segmentation, feature extraction, classification. And in addition, we are going to develop an application to control water pump from the android application to avoid overflow of water so that water will not be wasted.

Keywords: Agriculture, Leaf Diseases, Image Segmentation, Extraction, K-Mean Cluster, SVM Classifier, Android Application

I. INTRODUCTION

In India agriculture is one the most important economic factor because of most of our Indian people are dependent on agriculture. In other words, agriculture is support pillar of our nation as well as whole world. It is important to note that the huge population of the world depends solely on agriculture for their economic development. Agriculture plays a key role in the growth of any country, whose GDP depends entirely on it. In this economy, agriculture has a direct impact on the quality and quantity of grains and vegetables. However, different factors affect the type and quantity of these grains and vegetables. In addition, different climates and conditions in different parts of the world may affect these grains and vegetables with different diseases and different climate. Due to differing climates and conditions in different places, grains and vegetables are exposed to different diseases. Cultivators in any country that deals with these diseases suffer severe losses. But sometimes farmers have to face lots of issues like climate change, different diseases, shortage of water and it effects into the low productivity and loss of money and manpower. Due to the diseases farmers are not getting good quality of crops and good price in the market. So, there is need to increase the quality of crops so that farmers will get the good amount of market price. Our farmers do not know about diseases which are occurs on a plant at right time. We also require huge amount of time and skilled labour. In this paper present a mobile-based application for detecting diseases

occurring on plant leaf using image processing and machine learning. In our proposed system there are 5 steps as follows Image collection, Image pre-processing, image segmentation, feature extraction and classification. In image collection we collect the images then we remove the background noise and uneven border and then selection of feature and then we use the SVM algorithm for classification and regression problem. In addition, we are going to develop an application to control water pump to avoid wastage or overflow of water. This water pump will be handled (ON/OFF) automatically from android app. The mobile application has made life much easier for individuals, businesses, and organizations. This modern world has allowed for the creation of an extremely advanced water monitoring system by using the internet. This can monitor the water pump, organize the water surface, and more. The computerized use of water can be known as water automation which is a system to make sure the applicable use of water and minimize the human effort. It is used for one of a kind function such as irrigation in the agricultural land, water pump controlling. In this paper, we are going to develop water automation systems for controlling water pumps and cutting water leakage using various types of hardware and technology. This will involve developing water pump controllers, detecting water levels, and controlling water leakage. Using the water management system, you can automatically turn on/off the motors based on the water level in the tank. If the water level exceeds or drops below a predetermined level, the system will take action.

II. LITERATURE SURVEY:

- 1) In the research paper “GLCM Based Plant Leaf Disease Detection Using Multiclass SVM”, says that farmers are using expensive fertilizers for controlling various leaf diseases which are occurs on the plant’s leaf and if will be wastage of money as well as fertilizers, if fertilizers are used without identifying the diseases. So, for disease detection they have used multiclass SVM for classification and GLCM for feature extraction. [1]
- 2) In 2020, in the paper, “Disease detection of plant leaf using image processing and CNN with preventive measures”, Husnul Ajra uses CNN technique for detection of plant diseases and he says that the performance of CNN classifiers and its visualization for detection of leaf diseases is based on training and testing datasets which are presented in tabular form as a confusion matrix. In this paper, they have mentioned that the leaf diseases problem of grains and vegetables which are harmful for agricultural sector and they suggested a significant diagnostic approach of tomato and potato plant. [2]
- 3) In 2021, Pranesh Kulkarni and team in the paper, “Plant disease detection using image processing and machine learning”, that they have successfully developed a

- computer vision based system for plant disease detection with average 93% accuracy and 0.93 F1 score. [3]
- 4) Sakshi Raina and Dr. Abhishek Gupta says in the paper, "A Study on Various Techniques for Plant Leaf Disease Detection Using Leaf Image", that they have presented basics of plant diseases detection techniques used by various researches. They have used GPDCNN for disease detection and says it has higher recognition rate and learning rate. In this paper we found that it requires many guidelines to obtain satisfying results. [4]
 - 5) In the paper "Automated Water Management System", Rakib Ahemed and Mahfida Amjad have provided a system which can observe water tank and take action if water surface is high or low, it can automatically turn ON/OFF motor. But we decide to implement this method for automatic irrigation for plants or crops. Using this method, we have decided to supply water automatically i. e. from the mobile app we can operate the water motor easily and it will save the time as well as reduce the wastage of water also.

III. OBJECTIVE:

- 1) To detect diseased leaf, stem, fruit.
- 2) To quantify affected area by disease.
- 3) To find shape of affected area.
- 4) To determine color of affected area.

IV. METHODOLOGY:

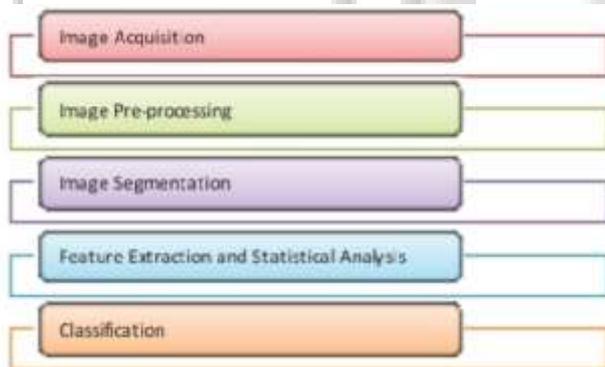


Fig. 1: Steps for disease detection

A. Phase 1:

1) Pre-processing Phase:

Pre-processing of data is an important step in image processing. Collected data may have background noise and uneven border. So, the pre-processing technique is used to get precise results to removed noise and uneven border.

2) Image Segmentation:

In image segmentation step the image is divided based on its properties. The large dataset is divided into small cluster. Image segmentation is divided into two type's i. e. threshold based and region based segmentation. In this work, K-means clustering technique is used for image segmentation. Input for segmentation is the data set given by us and output is in the form of cluster data.

3) Feature Selection:

Feature selection is the important step. In this project for the selection of feature we correlate the variable with the target variable. In this technique, we use GLCM (Gray Level Co-

occurrence Matrix) algorithm. This technique was first proposed in 1973 by Haralick. In this technique, co-occurrence features are obtained.

4) Classification Algorithm:

For the classification, support vector machine (SVM) is used. SVM is used to define decision boundaries of the decision plane which is hyperplane between any two classes in order to separate these classes. SVM chooses the extreme points or the vectors that helps to creating hyperplane.

B. Phase 2:

1) Control water pump through the mobile based application:

In order to control the pump that means turn ON or OFF the pump through the application. Controlling water pump means it can prevent overflow of water from the water tank and it also avoid the situation that water tank is empty.

V. PROPOSED SYSTEM:

A. Training Dataset:

The image from the dataset or capture by digital camera given as info to the training data and it gets into pre-processing phase in which background noise and uneven image are converted into quality or improved image. And in the next step GLCM (Gray level co-occurrence matrix) calculation is done. It is the technique in which image texture is considered and converted into grayscale. In the next step K-means cluster algorithm which is segmentation algorithm based on textural feature is connected. In the K-means clustering algorithm image are divided into subgroups or different cluster. In this algorithm focused point is determined from the Euclidean separation which is determined from the finding homogeneous subgroups within the data such that data points in each cluster are similar. K-means is iterative algorithm, so every time partition is performed by clusters, it divides the leaf image into different parts or cluster from which one or more cluster may contain diseases which says that leaf is infected by diseases. Using the SVM classifier we get affected area of the diseased leaf.

B. Testing dataset:

Here, data might be un-trained or prepared. In testing, the information is prepared, after extraction of the leaf or data. Then it permitted to go into the classification. If data is untrained then we need to do the segmentation. At that point k-means cluster calculation is done which is textural based calculation. In k-means clustering focused point is determined from which the Euclidean separation is determined and the information is clustered by homogeneous or similar properties. We are going to enter the number of groups in which we have ROI (Region of Interest). After entering subgroups or cluster number, using SVM classification, we detect the diseased leaf or defected area of leaf.

REFERENCE:

- [1] Glcm Based Plant Leaf Disease Detection Using Multiclass SVM by Shobana D, Shanthi T, Priya p, Anand R (Department of Electronics and Communication

- Engineering, Sona College of Technology, Salem, Tamil Nādu, India-637502).
- [2] Disease Detection of Plant Leaf using Image Processing and CNN with Preventive Measures. Husnul Ajra Department of Computer Science and Engineering Bangabandhu ,Sheikh Mujibur Rahman Sci.&Tech. University Gopalganj, Bangladesh (husnul5606ice@gmail.com), Mst. Khairun Nahar Department of Computer Science and Engineering Bangabandhu ,Sheikh Mujibur Rahman Sci.&Tech. University Gopalganj, Bangladesh (jakiabsmrstucse05@gmail.com), Lipika Sarkar Department of Computer Science and Engineering Bangabandhu ,Sheikh Mujibur Rahman Sci. &Tech. University Gopalganj, Bangladesh (lipika.cse15@gmail.com), Md. Shahidul Islam Faculty of Computing University Malaysia Pahang Kuantan, Malaysia (msi.ice.ru@gmail.com). 2020 Emerging Technology in Computing, Communication and Electronics (ETCCE).
- [3] Plant Disease Detection Using Image Processing and Machine Learning Pranesh Kulkarni¹, Atharva Karwande¹, Tejas Kolhe¹, Soham Kamble¹, Akshay Joshi¹, Medha Wyawahare¹ Department of Electronics and Telecommunication, Vishwakarma Institute of Technology, Pune, India.
- [4] A Study on Various Techniques for Plant Leaf Disease Detection Using Leaf Image Sakshi Raina Department of Computer Science and Engineering SMVDU, Katra Jammu, India (sakshi22513.cse@gmail.com), Dr. Abhishek Gupta Department of Computer Science and Engineering SMVDU, Katra Jammu, India (abhishek.gupta@smvdu.ac.in).
- [5] Automated Water Management System (WMS) Rakib Ahemed ^a , Mahfida Amjad, ^a B. Sc student of CSE, Stamford University Bangladesh, Bangladesh ^b Senior Lecturer, Department of CSE, Stamford University Bangladesh.