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Plant disease detection using Machine Learning

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ABSTRACT

Agriculture is considered to be the backbone and major revenue producing of our country. Crops play an important role in our daily routine providing us with nourishments. Due to environmental conditions, crops are getting affected with many diseases. Farmers are not able to detect these diseases at an early stage. Thus, assessment of crop condition is vital. The growing technology plays a major role and techniques like Machine Learning, Deep Learning are used. Here in this project focuses on the assessment of the crop condition with the help of their leaves, Healthy as well as diseased leaves are capture using cameras from real-time environments, K-means clustering is used for segmentation. After segmentation undergo classification using Machine learning algorithms in which healthy and diseased leaves are detected.

Keywords— *Support vector machine, image acquisition, pre-processing, segmentation, disease detection*

1. INTRODUCTION

The primary occupation in India is agriculture. A growing field of interest today's world is agriculture. One of the important occupations practiced in India and covers about 60% land. With the change in the environment due to factors like pollution, global warming, natural disasters, etc. farming has become difficult for farmers Thus modern agriculture or modern farming is used now a days for profitable farming. The latest techniques used in agriculture helps to analyze the soil condition of the fields, temperature, the pesticides that is best suited for specific crop, disease diagnosis, water level to be used etc.

Plant disease diagnosis uses techniques of Machine learning algorithm, Image Processing Techniques, Deep Learning for identifications of the healthy and a diseased crop. Machine Learning plays a crucial role in this field. The crop as a whole or the leaves of the plants are taken into consideration and analyzed by these techniques Machine Learning plays a crucial role in this field. The crop as a whole or the leaves of the plants are taken into consideration and analyzed by these techniques.

2. LITERATURE REVIEW

[1] T.Balaji, R. Bhalamurugan, M. R. Stalin John, Dr. K. Velmurugan published a paper titled "Versatile Applied For Agriculture Robot Vehicles" ,And it says about that finally we concluded that our proposal is used to humiliate the human effort in agriculture in the existing system the robot is a built for some specific application such as Fruit harvesting, Transplant handling, Sheep shearing.

[2] Julian Sanchez-Hermosilla and Francisco Rodriguez Ramon Gonzalez and Jose Luis Guzman2 and Manuel Berenguel proposed a research paper on 1st march 2010 titled as shown in it "A mechatronic description of an autonomous mobile robot for agricultural tasks in greenhouses", shows the mechanical robot has been carried out using CAD technologies in which the main features of greenhouses, the electronic components have been considered.

[3] Tony E. Grift proposed a research paper on 5th June in a year 2003 titled as the name is "Development of Autonomous Robotics for agricultural Applications" this says about the flexibility of the robot was not truly employed, since simple front wheel steering proved sufficient for between row guidance. The SCIK laser unit provided.

[4] Uan Tian, Chunjiang Zhao, Shenglian Lu and Xinyu Guo,it is titled as a "SVM-based Multiplier System for a Recognition of Wheat Leaf Disease", color features are represented I RGB to HIS, by using GLCM, seven types invariant moment are taken as shape for the parameter. They used SVM classifier which has MCS, used for detecting disease I wheat plant offline.

3. DESIGN

The figure 1 shows how the project flow goes. The figure 2 shows us the low-level design for the project where it contains 3 steps testing, training and Validation. All these steps how they run is explained in the below figure. The figure 3 shows the activity diagram of the project, shows what all are the activities the project includes.

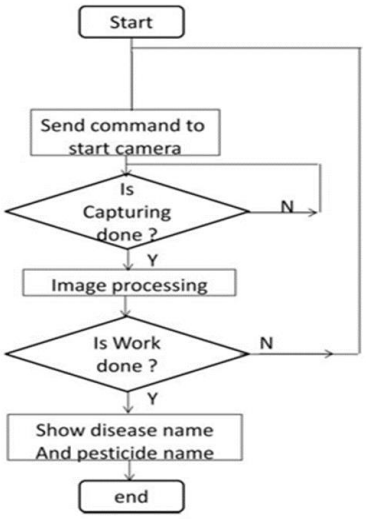

Fig. 1: Flow Chart

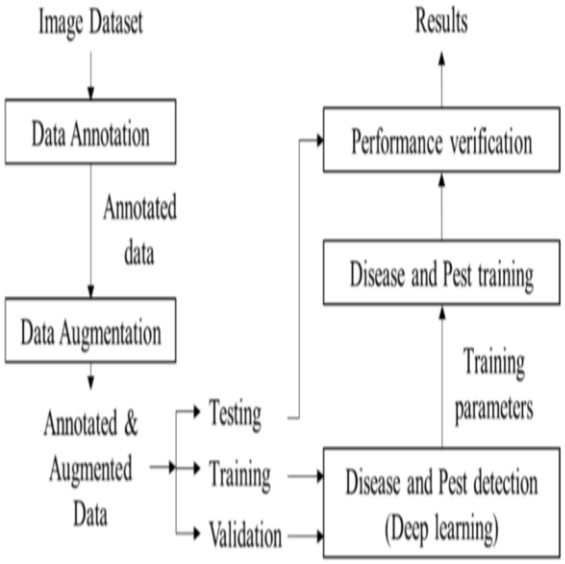

Fig. 2: Low Level Design

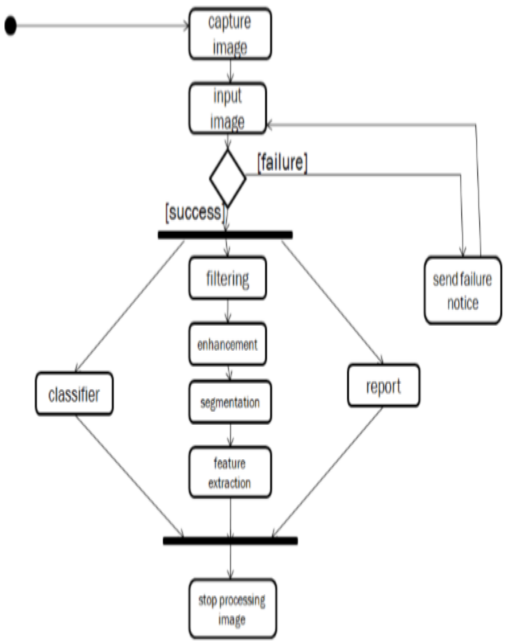

Fig. 3: Activity Diagram

3.1 Existing System

Earlier papers are describing to detect mainly pests like aphids, whiteflies, thrips, etc using various approaches suggesting the various implementation ways as illustrated and discussed below. A cognitive vision system that combines image processing, learning and knowledge-based techniques. They only detect mature stage of white fly and count the number of flies on single leaflet. They used 180 images as test dataset. among this images they tested 162 images and each image having 0 to 5 whitefly pest. They calculate false negative rate (FNR) and false positive rate (FPR) for test images with no whiteflies (class 1), at least one white fly (class 2) and for whole test set. The existing systems have few disadvantages as follows: They only detect based on shape and colour, Exact detection of disease is not possible with Existing Methods, Only Detect some disease based on low infestation stages by detecting eggs of white flies thus analysing behaviour of white flies, Accuracy is Low.

3.2 Proposed System

We use SVM (Support Vector Machine) algorithm in this project. SVM is a non-linear classifier, and is a newer trend in machine learning algorithm. SVM is popularly used in many pattern recognition problems including texture classification. SVM is a designed to work with only two classes. This is done by maximizing the margin from the hyper plane. The samples closest to the margin that were selected to determine the hyper plane is known as support vectors. Multiclass classification is applicable and basically built up by various two class SVMs to solve the problem, either by using one-versus-all or one. Another feature is the kernel function that projects the non-linearly separable data from low-dimensional space to a space of higher dimension so that they may become separable in the higher dimensional space too. It is used to detect the pest on leaves and also gives information about a type of pests. It gives a result of number of pests are presented. Then, it gives a remedy to take control over pests. Finally, the feature values are fed as input to the Support Vector Machine classifier, allow us to accurately distinguish the pests and leaves. This is an important step towards the identification of pests and to take the corresponding remedies. SVM provides most accurate result compared to other algorithms.

4. IMPLEMENTATION

There are four different modules:

4.1 Image Acqusition

The images are obtained using the digital camera which is further subjected to pre-processing.

Fig. 4: Image Acquisition

4.2 Image Pre-processing

The images which are obtained are subjected for pre-processing to increase the quality of image. The pre-processing steps may include colour transformation, noise removal etc. Here we use colour transformation where we convert RGB image into grey scale image.

Fig. 5: Image Pre-processing

4.3 Image Segmentation

Image Segmentation are of many types such as clustering, neural network and so on. In this we use clustering algorithm called shift clustering. The algorithm uses many sliding windows to converge the maximum dense region.

4.4 Feature Extraction

There are many features of an image. Here we consider three feature that are colour, shape and texture.

Fig. 6: Image Segmentation

Fig. 7: Feature Extraction

5. RESULT

The proposed system helps in identification of plant disease and provides a remedy that can be used as the defense mechanism against the disease. Using training data we will train our classifier and then output will be predicted with optimum accuracy. The software gives us the name of the plant species and also with its confidence level and also the remedy that can be taken as a cure if it is infected.

6. CONCLUSION

The proposed system was developed taking in mind the benefits of the farmers and agricultural sector. The proposed system are periodically monitors the cultivated crop. The developed system can detect disease in plant and also provide the remedy that can be taken against the diseases. By having the proper knowledge of the disease then the remedy can be taken for improving the health of the plant. The proposed system is based on python and gives an accuracy of around 78%. Here, machine learning algorithms provide good and better results. Machine Learning Techniques are used to train the model which helps us to take a proper decision regarding the diseases.

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