A MACHINE LEARNING APPROACH FOR PLANT DISEASE CLASSIFICATION AND PESTICIDE SUGGESTION USING RANK BASED ATTRIBUTE SELECTION

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Abstract– Agriculture productivity is something on which economy highly depends. But plant disease causes reduction in quality and quantity of crops. Farmers usually detect the symptoms visually but they are difficult to identify at a single glance. We capture images of infected plants using a digital camera from a field. Some of the automatic techniques are used to process and find the disease which reduces a work of farmer in monitoring the crops and at very early stage itself it detects the symptoms of diseases i.e. when they appear on the plant leaves. The images of the disease infected leaves are collected and they are processed. Using image processing techniques the diseased part of the leaf is extracted. The unnecessary green parts from the diseased portion are removed and features like color, shape, size are obtained. Then the features are ranked according to the impact of the disease. Using Support vector machine (SVM), the plant diseases are classified to suggest the proper pesticide along with the correct dosage and provide some prevention methods in order to prevent the plants from future problems.

Index Terms— Plant disease identification, ranking, pesticide suggestion, Support Vector Machine

1 INTRODUCTION

Agriculture plays an important role in economy country's Economic growth. Plant disease will reduce the quality and quantity of the crops. Because of this, diseases caused in the plants reduce the agricultural productivity. Visually observable symptoms are very difficult to identify at a single glance. Even Newbie farmers are not aware of symptoms. Continuous monitoring is required. Identification of plant leaf disease is one of the important research in agricultural and research domain. This paper defines one of the way for identification of disease using Image processing and Machine Learning. This project deals with the three major diseases of the rice plant which happens to be the major food crop in India. This project also suggests the prevention methods and pesticides for the identified disease. The main aim of our project is to create a platform which identifies the disease, suggest the pesticide and prevention methods which are very helpful for the farmers. This also reduces the loss in agricultural productivity. Section II describes Literature survey and Section III describes Methodology.

2 LITERATURE SURVEY

Harshadkumar B. Prajapati [1] identified the diseased usingimage preprocessing and K means clustering with the supervised machine Learning Algorithm called Support Vector Machine (SVM).

Ferentinos,Konstantinos.P[5] implanted the system by training the neural networks and uses five basic CNN technologies AlexNet, AlexNetOWTBn, GoogLeNet, Overfeat, Visual Geometry Group (VGG16 net).

Akmisra[2] uses the image data set preprocess the image and masked the green portion of the leaf ,cluster those images. Using those clusters the plant disease is identified.

Rangarajan[7] uses two pre-trained deep learning models namely AlexNet and VGG16 net were used for classifying 6 different diseases and a healthy class of the tomato crop from the image dataset.

Picon,Artzai,[9] creates a model for early disease detectionusing Residual Neural network. He used common deep learning-based architectures for image classification, Simple Linear Iterative Clustering (SLIC) for clustering and Object detection approach for disease classification.

3 METHODOLOGY

The proposed method uses the image data set of three rice plant diseases such as Bacterial leaf blight, Brown spot, Leaf Smut. The workflow is shown in Fig1.

It consists of:

1. Background Removal
2. Disease Segmentation
3. Feature extraction and ranking
4. Classification
5. Prevention measure and Pesticide suggestion

3.1 BACKGROUND REMOVAL:

In this system, we considered the background of the image as white. The leaf image which is affected by the disease is converted into HSV color space. The saturation component

of the HSV color space image is extracted. After getting saturation component, it is converted into a binary image and it is used as a mask to remove the background. The binary mask, in RGB color space is applied in order to generate the background removed image. This background removed image is used for further processing.

3.2DISEASE SEGMENTATION:

After the background removal and in order to get the accurate diseased portion from the image we use two techniques- K-means clustering and removing the unnecessary green portion of the leaf. Using K means clustering, the diseased portion of the leaf image is extracted. The three clusters namely diseased portion, non-diseased portion and background are used. From the diseased cluster the unnecessary green portion is removed using masking technique in order to obtain the exact disease portion. Then the diseased portion is used for feature extraction.

3.3 FEATURE EXTRACTION AND RANKING:

Features play a vital role in differentiating the diseases. However the selection of feature requires the proper understanding of extracted feature values. The three main features such as texture, shape and color are extracted. The extracted feature is then ranked based on the importance of the feature, since features play a vital role in every classifier. Feature selection is important criteria in every pattern recognition problem. Ranking the features also increases the accuracy of disease prediction.

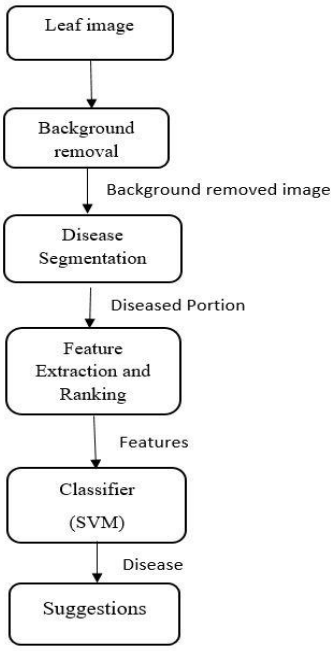

Fig1- Work flow

3.4 CLASSIFICATION:

The classification of the rice plant diseases is done using Support Vector Machine (SVM). SVM is a supervised machine learning algorithm that analyzes data for classification. The output of the SVM is stored with margins which are further apart. It classifies the training data based on the classes given as training class labels. Using the result from the classifier the disease is identified.

3.5 PREVENTION MEASURE AND PESTICIDE SUGGESTION:

Prevention and Pesticide suggestion play an important role in plant disease management. After identification of the disease from the SVM classifier, suggestions for the pesticides and prevention measures are given. The suggestions which are used are given in Table 1as follows:

Table1-Prevention and pesticide suggestion

Disease	Prevention	Pesticide
Bacterial leaf blight	1).Balanced fertilizer application - Split application of N 2).Reduce the disease spread by careful handling of seedlings during transplanting, maintaining shallow water in nurseries, providing good drainage during severe flooding.	1).Seed treatment with bleaching powder (100g/l) and zinc sulfate (2%) reduce bacterial blight. 2).Seed treatment - seed soaking for 8 hours in Agrimycin (0.025%) and wettableceresan (0.05%) followed by hot water treatment for 30 min at 52-54oC;
Brown spot	1).Proper crop nutrition and avoid water stress. 2). Do not use high nitrogenous	1).Seed is treated with Captan or Thiram at 2.0g /kg of seed. 2).Spray Mancozeb

	fertilizer	(2.0g/lit) or Edifenphos (1ml/lit) - 2 to 3 times at 10 - 15 day intervals.
Leaf smut	1).Use of disease-free seeds that are selected from healthy crop. 2).Seed treatment with carbendazim 2.0g/kg of seeds. 3).Avoid field activities when the plants are wet. 4).Early planted crop has less smut balls than the late planted crop.	1).During reproductive stage spraying of Copper oxychloride 50% WP at 2.5 gm/liter. If disease persists spray crop with Propiconazole 25% EC 1ml/litre of water after 15 days interval for effective control of disease. 2).Seed treatment with carbendazim 2.0g/kg of seeds.

4. EXPERIMENTAL RESULTS AND DISCUSSION

The dataset required for this study was collected from Kaggle website. The constraints that are needed for this model are

a) Diseased leaf image as an input and

b) Background of the image should be white.

These constraints are necessary in order to get accuracy in the output. The obtained output of the proposed system is as follows:

Fig.2 : Original image

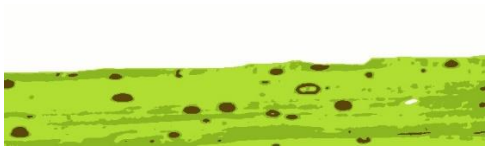

Fig.3 : Image after K means clustering

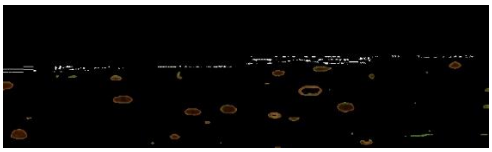

Fig.4: Extracted diseased portion

Fig.5: Output image

After this output stage, the pesticide suggestion and prevention measure is given to the user.

5. CONCLUSION AND FUTURE WORK

In this project we have identified the rice leaf disease such as Bacterial leaf blight, Brown spot and leaf Smut since rice plant diseases can make a big amount of loss in the agriculture domain. Our future enhancement will be classification of all possible cultivable plant diseases. An application to identify cultivable plant disease can also be developed which can be useful for the farmers.

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