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Cotton Leaves Disease Recognization by Multiple Classifiers

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ABSTRACT: Task of Diagnosis of plant disease is to identify the disease in the leaf or fruit or vegetable. Yearly About 42% of the world's agriculture harvest is destroyed by disease and pest. If plant diseases are correctly identified early then losses of harvest can be minimized and specific treatments can be applied on it. Manual identification of disease in the plant is time consuming process. Even the result is also not accurate .So by using image processing techniques we can obtain fast, automatic and accurate solution. This automatic identification can be done by using methods like Image Acquisition, Image Pre- processing, image segmentation, Feature extraction and classification using multiple classification algorithms. These are nothing but the methods of image processing. This paper provides algorithms of Neural Network and Naive Bayes Classifier to detect disease on images of cotton leaves. Paper shows the comparison between the existing system and proposed system which shows that NBC provide more accurate result.

KEYWORDS: Plant disease, image processing, KNN, SVM, NBC, etc

I. INTRODUCTION

India is an agricultural country . Agriculture sector provides livelihood to percent of the total population of country. Many of the industries are depend on agriculture sector for their raw-material and production for example sugar factory, cotton and jute textile industries, food industries, pharmaceutical industry or many more. Industries need good quality of material. So that Research sector are trying to increase the productivity and quality of agriculture. The main reason behind the decrease in the quality of the agricultural product is plant diseases.

Disease is an impairment of health or a condition of abnormal functioning. Plant diseases are caused by bacteria, viruses and fungi. The occurrence of plant diseases also depend on environmental condition. Disease requires careful diagnosis and handling at right time to protect the plant from heavy losses. Disease can be found in different parts of the plant like fruit, leaves, vegetable, and stem. Farmers require constant monitoring of experts which might be prohibitively expensive and time consuming. Depending on the applications, many systems have been proposed to solve or at least to reduce the problems, by making use of image processing and some automatic classification tools.

Structuring of remaining paper is as follows. Section II focuses on related work for plant disease detection. Section III provide an existing system. Section IV presents the proposed concept.Section V concludes the paper.

II. RELATED WORK

Tejal et. al [1] Propose a system for disease identification and grading. They done their work on pomegranate leaf and fruit and detect bacterial blight disease. To remove the shadow, which causes during image acquisition, morphology technique has been used as pre-processing. For segmentation K-means clustering method has been used. After segmentation AT (Total Area of leaf or fruit) and AD (Total disease area) are calculated. Using AT and AD PI (percent-infection) is calculated, Using PI grade of the disease is determined. For disease identification they consider two characteristics as for the leaf they checked diseased spot on leaf is bordered by yellow margin if yes then it

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signifies that leaf is infected by bacterial blight and for the fruit first black spots are identified and if crack passing through that black spot it signifies that fruit is infected by bacterial blight. By using proposed system they achieve precise, accurate and acceptable result.

Revathi and Hemalatha [2] give a Homogeneous pixel counting technique for cotton disease detection (HPCCDD). By using canny and sobel edge detection homogenous techniques segmentation is done while proposed HPCCDD algorithm has been used for analysis and classification. By using proposed algorithm 98.1% accuracy has been achieved.

Gavhale et. al [3] proposed a method for citrus leaf disease detection. In pre-processing step image enhancement and color space conversion have been done. In feature extraction method GLCM texture feature and color texture feature are extracted while for classification SVM classifier has been used.

Monika et. al [4] Give a system for disease detection and fruit grading. For feature extraction three feature vectors have been used, namely, color, texture and morphology in which morphology give better result. For the classification artificial neural network has been used. For the fruit grading two methods are used spread of disease and automated calculation of mango weight. In spread of disease method percent infection is calculated by using K–means clustering and in second method by using number of pixel weight is calculated and as per the weight quality of the fruit is decided.

III. EXISTING SYSTEM

Existing system is based on use of single classifiers with different features. Camargo et al. [1] proposed a machine vision system for automatic recognition of different classes represented by the damages of a pest insect .Their approach is based on a set of features including color, texture, shape, lacunarity, fractal dimension and Fourier descriptors, which are needed to achieve the classification by SVM method.AI Bashish et al. introduced a recognition system of five classes of diseases .Their approach is based on Haralick texture attributes and neural networks for classification. And in another approach they have used parallel combination of SVM an NN.

IV. PROPOSED WORK

In our proposed system we will focus on diseases of the Cotton plants that are cultivated in the region of Khandesh , Maharashtra. Cotton is produced on large scale in khandesh region. We will try to find out diseases on the Cotton leaves with the help of Image Processing Technique. This system will works on the detection of four types of disease such as Alterneria leaf spot, Bacteria Blight leaf spot, Coresepora leaf spot and leaf curl disease. To classify these diseases individual and combination of classifiers are used. The classifiers are Neural Network Classifier and Naive Bayes Classifier .This approach is based on set of features including colour ,texture and shape. In this work we display the performance of Naive bayes classifier. In further work will show the result of individual work of both classifiers and combination of them.

V. NEURAL NETWORK

The classifier is trained first. Then the resulting rule set is used to classify unseen data. Classifier algorithm has many features like:

- Speed - NN is significantly faster than ID3 (it is faster in several orders of magnitude)
- Memory - NN is more memory efficient than ID
- Size of decision Trees – NN gets smaller decision trees.
- Ruleset - NN can give ruleset as an output for complex decision tree.
- Missing values – NN algorithm can respond on missing values by _?‘
- Overfitting problem - NN solves overfitting problem through

Algorithm

1. Accept input sample
2. Perform its weighted summation.
3. Apply it to input layer neurons.

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4. Process all inputs at each neuron by transfer function to get individual.
5. Hidden layer and repeat 1,2,3,4 steps pass it as an input to all neurons of for hidden layer neurons.
6. Pass output of hidden layer neurons to all output layers and repeat 1,2,3,4 steps to get final output.
7. Display the final output.

V. NAIVE BAYES CLASSIFIER

It gains popularity because it offers the attractive features and powerful machinery to tackle the problem of classification i.e., we need to know which belongs to which group and promising empirical performance. The Naïve Bayes is based on statistical learning theory. Naïve Bayes's better generalization performance is based on the principle of Structural Risk Minimization (SRM). The concept of SRM is to maximize the margin of class separation. The Naïve Bayes was defined for two-class problem and it looked for optimal hyper-plane, which maximized the distance, the margin, between the nearest examples of both classes, named Naïve Bayes.
At present Naïve Bayes is popular classification & prediction tool used for pattern recognition and other classification purposes. The standard Naïve Bayes classifier takes the set of input data and predicts to classify them in one of the only two distinct classes. Naïve Bayes classifier is trained by a given set of training data and a model is prepared to classify test data based upon this model. For multiclass classification problem, we decompose multiclass problem into multiple binary class problems, and we design suitable combined multiple binary Naïve Bayes classifiers. Most traditional classification models are based on the empirical risk minimization principle. Naïve Bayes implements the structural risk minimization principle which seeks to minimize the training error and a confidence interval term. A number of applications showed that Naïve Bayes hold the better classification ability in dealing with small sample, nonlinearity and high dimensionality pattern recognition. Naïve Bayes are based on the concept of decision planes that define decision boundaries. A decision plane is one that separates between a set of objects having different class memberships. The classifier that separates a set of objects into their respective classes with a line. Most classification tasks, however, are not that simple, and often more complex structures are needed in order to make an optimal separation, i.e., correctly classify new objects (test cases) on the basis of the examples that are available (train cases).
All the information from above processes is given to multiclass SVM . The Multiclass SVM is used for cotton leaf spot disease classification. The cotton leaf color is segmented corresponding to number of weight vectors. Information from segmented images both diseased and non-diseased pixels are used for training in support vector machine for cotton leaf disease segmentation.

VI. RESULT

With around 100 images and 5 classes(4 disease & pure leaf) for classification Naive Bayes Classifier is used for detection and classification of diseases on cotton plant. It is based on shape texture and color for feature extraction .The experimental setup generates results for precision, recall & F-Measure for NBC.

	Precision	Recall	F-Measure
alternaria leaf spot	73.33	100	84.61
bacteria blight	79.16	86.36	82.60
cercospora	73.33	91.66	81.48
leaf curl	76.47	86.66	81.25
pure leaves	82.60	90.47	86.36

Table 1:Calculation of NBC

Approches	Classification method	Accuracy
Al Bashish et al[1]	Neural Network	74.40%
\Camargo et al [2]	SVM	82.93%
Wang et al [3]	Neural Network	79.27%
Proposed System	NBC	83.26%

Table 2:Comparison with previous approach

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Table1 shows the calculation of Naive Bayes Classifier. Table 2 demonstrates the comparison between the proposed approach and the three existing approaches depending on the adopted features, classification method and the global recognition rate. This last is expressed in percentage with the ratio between the number of recognized images and the total images used for the test. The global recognition rate of the proposed method is 83,26%.

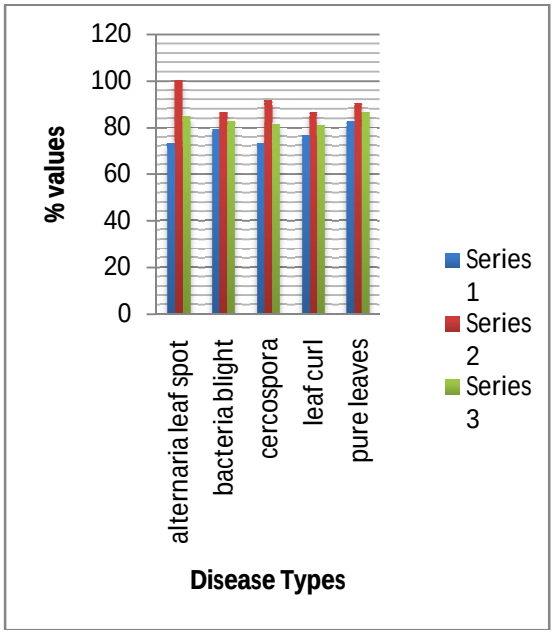

Chart 1:Performance of NBC

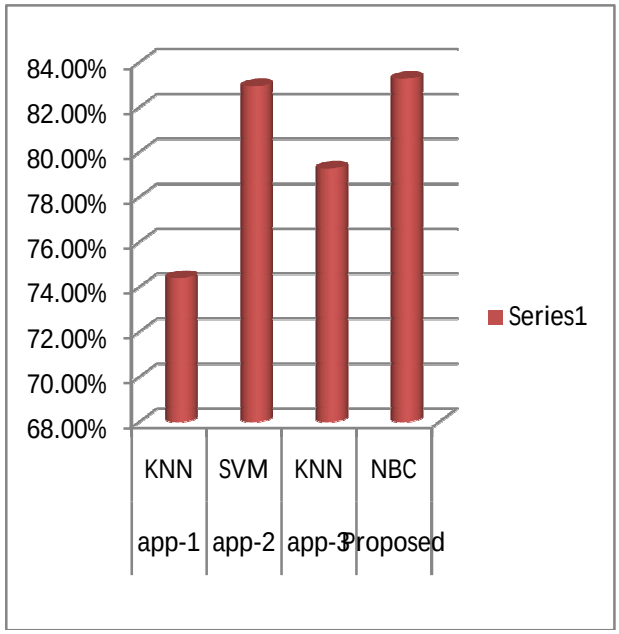

chart 2:Accuracy of proposed with existence

Chart 1 shows performance of NBC and chart 2 shows the accuracy of proposed system with existence system.

VI. CONCLUSION AND FUTURE WORK

Plant Disease detection is very momentous and efficient research field. The paper purpose is to present an outline of established method for plant disease detection and study of recent growth. Experiment result shows that the techniques for detection of plant diseases using Neural network and Naïve Bayes for parallel classification and K-means clustering for segmentation generates better results in terms of detection accuracy. All these techniques are used to analyses the healthy and diseased cotton plants leaves. As per the results it is clear that these proposed disease detection techniques have an ability to detect cotton plant diseases with efficient manner.

In further work will show the result of individual work of both classifiers and combination of them. In future research it would be interesting to apply proposed system algorithms on various different types of leaves. Also proposed system can be tested on large dataset to get the idea about efficiency in terms of processing speed and communication cost for system.

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BIOGRAPHY

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