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## Improvement in Plant Diseases Detection Rate with Enhanced SVD Technique

Jaswinder Kour<sup>1</sup>, Diksha Mahajan<sup>2#</sup>, Palmeet Kour<sup>3</sup>

Asst. Professor, Department of Information Technology, MBSCET, Jammu, J&K, India<sup>1</sup>

Asst. Professor, Department of Humanities and Social Sciences, MBSCET, Jammu, J&K, India<sup>2</sup>

Lecturer, Department of Masters in Computer Applications, MBSCET, Jammu, J&K, India<sup>3</sup>

**ABSTRACT:** In today's modern era, agriculture has become one of the most important parts of the population. Energy is the fundamental part of the global warming and major source of plants also. There are many types of diseases which are present in plants. To detect these diseases pattern are required to recognize them. A common approach in this case is the use of remote sensing techniques that explore multi and hyper spectral pictures. The methods that employ digital image processing tools to achieve their goals. The naked eye observation method is generally used to decide diseases severity in the production practice but results are subjective and it is not possible to measure the disease extent precisely. There are various pattern recognition algorithm which gives detection of disease. In the existing work back propagation and principal component analysis are used to detect plant diseases. These algorithms are learned from training supervision in neural network. There is an issue of lower accuracy in these algorithms. These algorithms are able to detect diseases in plant but inefficient way. So to increase the accuracy for plant detection a new method will be proposed. In this method BP, PCA are combined with SVD to increase the accuracy of the detection.

**KEYWORDS:** Back Propagation, Principle Component Analysis, Plant diseases, Pattern reorganization

### I. INTRODUCTION

Image Processing is a process to convert an image into digital form and perform some operations to get an enhanced image and extract useful information from it. It is a study of any algorithm that takes an image as input and returns an image as output. Image processing is referred to processing of a 2D picture by a computer [1]. Agriculture is means to feed ever growing populations which is very common in India. In today's modern era, agriculture has become one of the most important parts of the population. Energy is the fundamental part of the global warming and major source of plants also. There are many types of diseases which occur in plants and which affect plants with aim to cause shocking social, economical and ecological losses. Now diagnosing diseases in a proper and accurate way is most important thing [2]. There are many ways to detect pathologies of plants. Some diseases even don't have any kind of visible symptoms linked and even they appear only when it is too late and can't help. In those cases, normally some kind of complicated analysis is done, usually by means of powerful microscopes which become necessary [3]. In many cases, the signs can only be detected in parts of the electromagnetic spectrum that are not visible to human eye. A very common technique in this case is the use of remote sensing techniques that discover multi and hyper spectral image captures. The methods that adopt and use this technique often employ digital image processing tools to achieve their goals. The naked eye observation method is generally used to decide diseases severity in the production practice but results are subjective and it is not possible to measure the disease extent precisely. Image processing technology in the agricultural research has made significant development.

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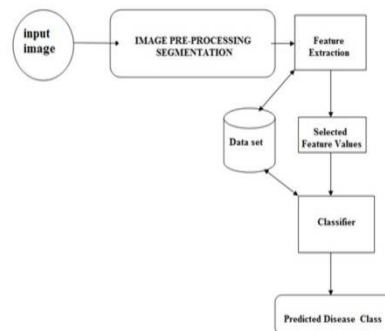


Fig.1 Basic steps to detect disease in plant

Artificial neural network is collected of interconnecting of artificial neurons. Artificial neural network is used to solve artificially intelligence problems or to gain understanding of biological neuron without creating any model. Biological neural networks are made up of real biological neurons that are connected or functionally related in nervous system. Neural network has been motivated by the architect of human brain. The brain is parallel computer, highly complex and nonlinear. The brain has capability to organize its constituent's structure known as neurons to perform composite computations. It is faster than digital computer exit in today's world [8].

## II. REVIEW OF LITERATURE

In paper [1] present a survey on different classification techniques that can be used for plant leaf diseases classification. There are so many classification techniques such as k-Nearest Neighbor Classifier, Probabilistic Neural Network, Genetic Algorithm, Support Vector Machine, and Principal Component Analysis, Artificial neural network, Fuzzy logic. Selecting a classification method is always a difficult. The k-nearest-neighbor method is perhaps the simplest of all algorithms for predicting the class of a test example. An obvious disadvantage of the k-NN method is the time after that SVM was found competitive with the best available machine learning algorithms in classifying high-dimensional data sets. Also SVM is more complex to understand and implement. In this paper they introduced [2] plant disease detection and its prevention. Most plant diseases are due to bacteria, viruses and fungus. Fungi are recognized first and foremost from their morphology, with emphasis placed on their reproductive structures. Bacteria are painstaking more prehistoric than fungi and generally have simpler life cycles.. The developed processing scheme consists of four main steps, first a color transformation structure for the contribution RGB image is created, and this RGB is transformed to HSI for color generation and his for color descriptor. Then green pixels are cloaked and removed using specific threshold value, then the image is segmented and the useful segments are extracted, finally the texture statistics is computed from SGDM matrices. Finally the presence of diseases on the plant leaf is evaluated. In this paper they proposed [3] and experimentally evaluate a software solution for automatic detection and classification of plant diseases through Image Processing.. This paper addresses this problem with the objective of developing image processing algorithms that can recognize problems in crops from images, based on colour, texture and shape to automatically detect diseases or other conditions that might affect crops and give the fast and accurate solutions to the farmer with the help of SMS. The plan and realization of these technologies will greatly aid in selective chemical application, dropping costs and thus leading to enhanced productivity, as well as improved produce. In this paper they proposed [4] a methodology for detecting plant diseases early and accurately, using diverse image processing techniques and artificial neural network (ANN). India is an agrarian country and farmers faced many difficult due to plant diseases. It is very difficult to detect disease with naked eye. Capturing the images is the first step. Using Gabor filter image is Filtered and segmented. Then color features and texture are extracted from the result of segmentation and Artificial neural network ANN. Experimental results showed that classification performance by ANN taking feature set is better with an accuracy of 91%. In this project work the area of plant diseases recognition is introduced. The system developed here is for plant diseases recognition, the development of good classification methods and precise features is

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very important in order to run the system in real time. Therefore proposed approach which is based on Gabor filter for feature extraction and ANN classifier for classification got a better results and recognition rate up to 91%. An ANN based classifier is adopted which uses the combination of color and texture features to recognize and classify different plant diseases. The results are encouraging and promise the development of a good machine vision system in the area of recognition and classification of plant diseases. In paper [5] contains the survey of various image processing techniques to detect various plant diseases using machine learning. Now a day's image processing technique is becoming a key technique for diagnosing the various features of the crop. The diseases can affect any part or area of the crop. This paper mainly focuses detection of various cotton crop diseases and to classify them. There are so many classification techniques such as k-Nearest Neighbor classifier , k-means Classifier, Probabilistic Neural Network, Genetic Algorithm, Support Vector Machine, and Principal Component Analysis, Artificial neural network, Fuzzy logic. Selecting a classification method is always a difficult task because the quality of result can vary for different input data. This paper provides an overview of different classification techniques used for plant leaf disease classification

### III. VARIOUS ALGORITHMS OF NEURAL NETWORKS

There are various algorithm to analysis the performance and detect diseases in plants. These are

- **BPA** Back-propagation provides a way to train networks with any number of hidden units arranged in any number of layers. In fact, the network does not have to be organized in layers - any pattern of connectivity that permits a partial ordering of the nodes from input to output is allowed. Connections go from -the input to the output for all the units. Connection pattern must not contain any cycles [10].
- **PCA** Principal Component Analysis is a mathematical Procedure that makes use of orthogonal transformation to convert a set of observation of correlated variables and uncorrelated variables [7].
- **SVDS** Singular Value Decomposition (SVD) is said to be a significant topic in linear algebra by many renowned mathematicians. SVD has many realistic and speculative values. The special feature of SVD is that it can be performed on any real (m, n) matrix. The SVD is the optimal matrix decomposition in a least square sense that it packs the maximum signal energy into as few coefficients as possible. Singular value decomposition (SVD) is a stable and effective method to split the system into a set of linearly self-determining components, and gives energy contribution. Singular value decomposition (SVD) is a numerical technique used to diagonalizable matrices in numerical analysis. SVD is an important algebraic transform for image processing, because of its endless advantages, such as maximum energy packing which is usually used in compression ability to manipulate the image in base of two distinctive subspaces data and noise subspaces, which is usually uses in noise filtering and also was utilized in watermarking applications. Each of these applications exploit key properties of the SVD [5]. Also it is usually used in solving of least squares problem, computing pseudo- inverse of a matrix and multivariate analysis. SVD is robust and reliable orthogonal matrix decomposition methods, which is due to its conceptual and stability reasons becoming more and more popular in signal processing area. SVD has the ability to adapt to the variations in local statistics of an image [7].
- **Pattern Recognition** Pattern recognition aims to classify patterns based on either a priori knowledge or on statistical information extracted from the patterns. The patterns to be classified are usually groups of measurements or observations, defining points in an appropriate multidimensional space [9]. Pattern recognition consists of sensor which gathers all the information. An extraction feature is used to collect all the valid information from the image and collects its observation. Classification scheme is used to classify observed observation into particular category. The classification or description scheme is usually based on the availability of a set of patterns that have already been classified or described. The training sets are patterns and Supervised comes under learning results. Learning can be unsupervised means doesn't have any prior learning knowledge.

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## IV. PROPOSED METHODOLOGY

Neural pattern recognition employs the neural computing paradigm that has emerged with neural networks. There is problem of accuracy in existing methods to overcome this problem a method will be proposed with SVD algorithm to enhance its accuracy. In first two algorithms BPA and PCA has less accuracy which is unable to detect accurate diseases in plants. But with the help of SVD we will enhanced the accuracy of the plant diseases so that it can be detected accurately. After image declare train and training data sets before find key points or descriptors we convert image into pyramid shape then do extreme detection in which we match each and every position of image which we have to compare with training image then find accurate position of particular object rather than precise location in base algorithm. Filtering process is done in between that because if some location of point not clear then it will show using filtering. Then find direction of points in which it all depends on angle when its completely done then compare is done between right image or left image. After that matching proceed on the basis of these points using the threshold function in which, set some threshold  $T$  ( mostly in the range 0.3 to 0.7). it take the ratio of first nearest distance to second nearest distance and would be less than this threshold, then only it is a match and save that index. otherwise there is no match. Matching will done using according to descriptors or key points find in basic or compare image using that it will match us and give the result how many number of points will match in the final output. After matching complete, Then find image masking,. In which they are using an image as a mask. A mask image is simply an image where some of the pixel values id zero or some has non-zero value. The whole scenario has been implemented on MATLAB tool which gives better results for the detection of plant diseases.

## V. EXPERIMENTAL RESULTS

In this paper, image recognition of grape and wheat diseases was done with help of BP networks, a type of neural approach. Two type of accuracy is to calculate that is Predication accuracy and Fitting accuracy.

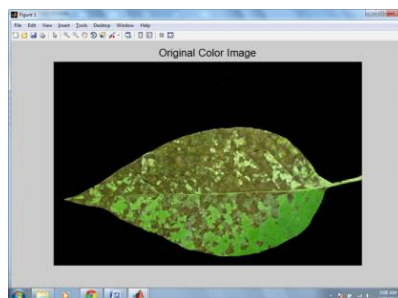


Fig. 2 Infected plant leaf

Fig.2 shows the dataset is taken which contain multiple images and this dataset will be put into the folder named as training dataset. The second folder called train dataset contains some images. The images of the train folder will match with the images of the trained folder for the feature matching SIFT algorithm will be applied. In the figure, leaf whose features are matched will be extracted and in that leaf where are the diseases will be detected using enhanced-SVM.

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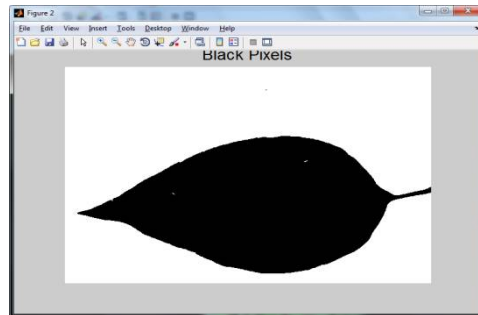


Fig. 3 Infected plant leaf

Fig 3 shows that the dataset is taken which contain multiple images and this dataset will be put into the folder named as training dataset. The second folder called train dataset contains some images. The images of the train folder will match with the images of the trained folder for the feature matching SIFT algorithm will be applied. In the figure, leaf whose features are matched will be extracted and in that leaf where are the diseases will be detected using enhanced SVM. The black background from the leaf will be extracted to know that how much portion of the leaf will be cut.

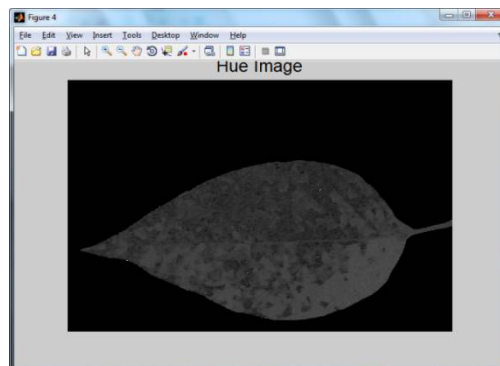


Fig. 4. Infected plant leaf

Fig 4 shows that the dataset is taken which contain multiple images and this dataset will be put into the folder named as training dataset. The second folder called train dataset contains some images. The images of the train folder will match with the images of the trained folder for the feature matching SIFT algorithm will be applied. In the figure , leaf whose features are matched will be extracted and in that leaf where is the diseases will be detected using enhanced SVM.

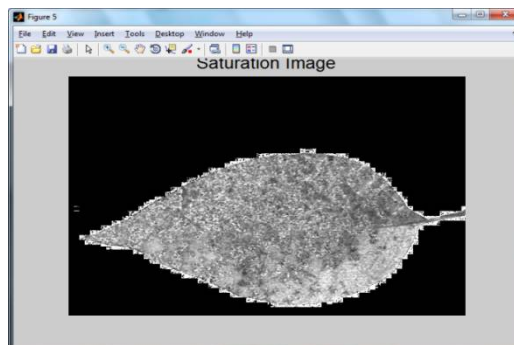


Fig. 5 Saturation Image

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The black background from the leaf will be extracted to know that how much portion of the leaf will be cut. The HUE value of infected leaf will be calculated which helps to increase detected accuracy. Fig 5 shows that, the dataset is taken which contain multiple images and this dataset will be put into the folder named as training dataset. The second folder called train dataset contains some images. The images of the train folder will match with the images of the trained folder for the feature matching SIFT algorithm will be applied. In the figure, leaf whose features are matched will be extracted and in that leaf where is the diseases will be detected using enhanced SVM. The black background from the leaf will be extracted to know that how much portion of the leaf will be cut. The SATURATION value of infected leaf will be calculated which helps to increase detected accuracy.

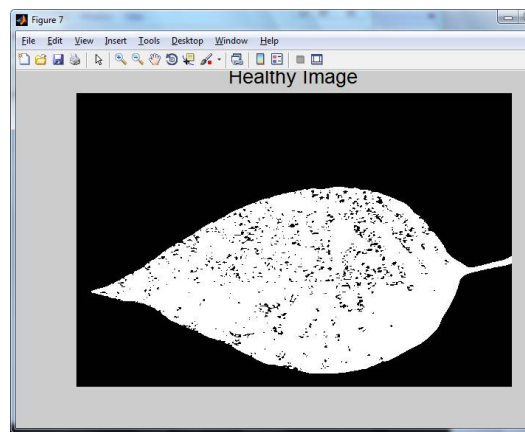


Fig. 6 Healthy Image

Fig 6 the dataset is taken which contain multiple images and this dataset will be put into the folder named as training dataset. The second folder called train dataset contains some images. The images of the train folder will match with the images of the trained folder for the feature matching SIFT algorithm will be applied. In the figure, leaf whose features are matched will be extracted and in that leaf where is the diseases will be detected using enhanced SVM. The black background from the leaf will be extracted to know that how much portion of the leaf will be cut. The SATURATION value of infected leaf will be calculated which helps to increase detected accuracy. In this figure the enhanced SVM algorithm will be applied which will separate the uninfected portion of the leaf.

### VI. CONCLUSION

In this paper, two types of diseases of grapes and wheat was detected named grape downy mildew and grape powdery mildew and wheat stripe rust and wheat leaf rust with BP networks. Three color features color, texture and shape and their combination was used. Image recognition using BP network was also conducted based on dimension reduced data obtained by PCA. PCA was used to reduce the dimensions of feature data of extracted images. By this method, the plant diseases can be identified at the initial stage itself and control can be obtained. Although the optimal recognition result were good and get the required results when the dimensions of the feature data was reduced by the PCA but when compared accuracies was lower. Better recognition results may be obtained if some other methods could be used to reduce the dimensions of the feature data. In future DCT-DWT algorithms can be applied with SVD to improve its accuracy more.

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