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A Review on Leaf Disease Detection using Image Processing

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Abstract: Identification of the leaf diseases is the key to preventing the losses in the yield and quantity of the agricultural product. The studies of the leaf diseases mean the studies of visually observable patterns seen on the leaf. Health monitoring and disease detection on leaf is very critical for sustainable agriculture. It is very difficult to monitor the leaf diseases manually. It requires tremendous amount of work, expertize in the leaf diseases, and also require the excessive processing time. Hence, image processing is used for the detection of leaf diseases. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification. This paper discussed the methods used for the detection of leaf diseases using their leaves images.

Keywords –Disease detection. Image acquisition, Segmentation, feature extraction

I. Introduction:

In recent years, agriculture has become much more important than it used to be some years back where plants were only used to feed humans as well as animals. This is due to the fact that plants are now used to generate electricity and other sources of energy to improve upon the living conditions of mankind. However, there are so many diseases that affect plants that can cause great harm to various economies and societies. It can even lead to great ecological losses. For this reason, it is better to diagnose diseases accurately and timely to avoid such loses. Plant diseases can be detected through several means including manual and computer based systems. Most plant diseases appear as spots on the leaves which are more visible to human eye. On the other hand, there are some diseases that do not appear on the leaves and others appear in the later stages when they have already caused great harm to the plants. In such instances, it is recommended that computerized systems would be the only option to detect the situation timely using some kind of complex algorithms and analytical tools, preferably through the use of powerful microscopes and other machines. In some other instances, the signs can only be detected through the electromagnetic means which produces more images that are not visible to the human eye.

India is a cultivated country and about 70% of the population depends on agriculture. Farmers have large range of diversity for selecting various suitable crops and finding the suitable pesticides for plant. Disease on plant leads to the significant reduction in both the quality and quantity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants. Monitoring of health and disease on plant plays an important role in successful cultivation of crops in the farm. In early days, the monitoring and analysis of plant diseases were done manually by the expertise person in that field. This requires tremendous amount of work and also requires excessive processing time. The image processing techniques can be used in the plant disease detection. In most of the cases disease symptoms are seen on the leaves, stem and fruit. The plant leaf for the detection of disease is considered which shows the disease symptoms.

II. Literature Review:

Arti N. Rathod (2014) et al. proposed in agriculture research of automatic leaf disease detection is essential research topic as it may prove benefits in monitoring large fields of crops, and thus automatically detect symptoms of disease as soon as they appear on plant leaves. There are the main steps for disease detection of Image Acquisition, Image Preprocessing, Image Segmentation, Feature Extraction and Statistical Analysis. This proposed work is in first image filtering using median filter and convert the RGB image to CIELAB color component, in second step image segmented using the k-medoid technique, in next step masking green-pixels & Remove of masked green pixels, after in next step calculate the Texture features Statistics, in last this features passed in neural network. The Neural Network classification performs well and could successfully detect and classify the tested disease.

Ms. Kiran R. Gavhale (2014) et al. described diseases in plants cause major production and economic losses as well as reduction in both quality and quantity of agricultural products. Now a day's plant diseases detection has received increasing attention in monitoring large field of crops.

Farmers experience great difficulties in switching from one disease control policy to another. The naked eye observation of experts is the traditional approach adopted in practice for detection and identification of plant diseases. In this paper we review the need of simple plant leaves disease detection system that would facilitate advancements in agriculture. Early information on crop health and disease detection can facilitate the control of diseases through proper management strategies. This technique will improves productivity of crops. This paper also compares the benefits and limitations of these potential methods. It includes several steps viz. image acquisition, image pre-processing, features extraction and neural network based classification.

Dhawale Sariputra (2016) et al. proposed the conventional technique for leaf disease detection involves of calling an expert person who can identify the diseases based on his understanding and that costs too much for an ordinary farmer in an emerging country such as India as stated above. Hence an alternative is mandatory for a country like India where a low cost but technology dependent system is required. To fulfill this, purpose a system is proposed which can identify the diseases on the plants with the help of technology. It will take input image from user which is to be processed. It will preprocess the image and then the green pixels from the image is removed which are nothing but the healthy part of the leaf. The GUI development of this project is done in Matlab. These methods result is shown in GUI. In the future work other part is segmented and the useful segments are selected for further analysis which consist of feature extraction and the statistical analysis of those features. After this the final information about disease of that plant is displayed. The classifier used in this proposed system is Neural Network classifier hence once trained such classifier can provide results in better manner compared to the conventional systems.

Piyali Chatterjee (2016) et al. proposed the analysis of the plant diseases may involve the detection of the abnormalities introduced in the plant leaves, which may or may not be visible to the naked eyes. With the layman's idea of the problems in plants, one cannot proceed with any random solution in the form of any pesticide or fertilizer, unless there's a sheer and accurate understanding of the disease spots and proper pattern recognition which otherwise would lead to a catastrophic situation where besides the loss of the money, the plant will remain untreated and the diseases will also get more time to spread. In order to combat this situation effectively, an artificial intelligence technique has been employed in this paper using k-means clustering (segmentation). The work begins with image acquisition, image enhancement and restoration, and information extraction from images for further computer analysis.

Prajakta Mitkal (2016) et al. proposed nowadays many of the farmers and agro help center use the different new technology to enhance the agriculture production. Plants have become important source of energy. There are several diseases that affect plants with the potential to cause economic and social losses. Many of disease are most popular where disease spots occur on the sugar cane plant leaves. If the disease are not detected at first stage than it is more harm full to production. To find out particular disease using Digital image processing helps to find disease and provide prevention for particular disease which types pesticide need to prevent disease. Firstly take Input image in RGB form then the green pixels are removed then the image is segmented useful segment used for extraction finally texture statistics is completed and according to analysis disease prevention is provided.

Sushil R. Kamlapurkar (2016) proposed the identification of disease on the plant is a very important key to prevent a heavy loss of yield and the quantity of agricultural product. The symptoms can be observed on the parts of the plants such as leaf, stems, lesions and fruits. The leaf shows the symptoms by changing colour, showing the spots on it. This identification of the disease is done by manual observation and pathogen detection which can consume more time and may prove costly. The aim of the project is to identify and classify the disease accurately from the leaf images. The steps required in the process are Preprocessing, Training and Identification. The disease considered are Powdery Mildew, Downey Mildew which can cause heavy loss to Grape fruit. For identification of disease features of leaf such as major axis, minor axis etc. are extracted from leaf and given to classifier for classification.

K.Narsimha Reddy (2017) et al. proposed survey on different classification techniques that can be used for plant leaf diseases classification. Identification of symptoms of disease by naked eye is difficult for farmer. Crop protection in large frames is done by using computerized image processing technique that can detect diseased leaf using color information of leaves. 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 task because the quality of result can vary for different input data. Plant leaf disease classifications have wide applications in various fields such as in biological research, in Agriculture etc. This paper provides an overview of different classification techniques used for plant leaf disease classification.

Malti K. Singh (2017) et al. proposed about 70% of the India economy depends on agriculture. Due to environmental changes such as rainfall, temperature, the crop yield gets affected severely. Phaseolus vulgaris L. is an important food legume crops and provide essential diet for millions of people across the world. It is affected by various diseases out of which Anthracnose are of major importance. Anthracnose disease is caused by fungus Colletotrichum lindemuthianum. Camellia assamica (J. W. Mast.) W. Wight is one of the most popular non-alcoholic beverage crops in the world. The leaf gets severely affected by fungus Alternaria alternata. Development of automatic detection system using advanced computer technology such as image processing help to support the farmers in the identification of diseases at an early or initial stage and provide useful information for its control. Therefore the present study was carried out on automatic disease detection of plant leaf of Phaseolus vulgaris (Beans) and Camellia assamica (Tea) using image processing techniques. It involves image acquisition, image preprocessing, image segmentation, feature extraction and classification.

Sandesh Raut (2017) et al. proposed for increasing growth and productivity of crop field, farmers need automatic monitoring of disease of plants instead of manual. Manual monitoring of disease do not give satisfactory result as naked eye observation is old method requires more time for disease recognition also need expert hence it is non effective. So in this paper, we introduced a modern technique to find out disease related to both leaf and fruit. To overcome disadvantages of traditional eye observing technique, we used digital image processing technique for fast and accurate disease detection of plant. In our proposed work, we developed k-means clustering algorithm with multi SVM algorithm in MATLAB software for disease identification and classification.

Vishal Mani Tiwari (2017) et al. proposed image processing has spread its wings in human life upto the extent that image has become an integral part of their life. There are various applications of image processing in the field of commerce, engineering, graphic design, journalism, architecture and historical research. In this research work, Image processing is considered for the analysis of plant leaf diseases. Plant leaf diseases can be detected based on the disease symptoms. Here, dataset of disease affected leaves is considered for experimentation. This dataset contains the plant leaves suffered from the Alternaria Alternata, Cercospora Leaf Spot, Anthracnose and Bacterial Blight along with some healthy leaf images. For this analysis, an autonomous approach of modified SVM-CS is introduces. Here, concept of cuckoo search is considered to optimize the classification parameters. These parameters further help to find more accurate solutions. This autonomous approach also extracts the healthy portion and disease affected leaf portion along with the accuracy of results.

Dr. Sridhathan (2018) et al. proposed economy of a country depends on agricultural productivity. Identification of the plant diseases is the key for preventing the losses in the productivity and improving the quality of the agricultural product. Traditional methods are reliable but require a human resource for visually observing the plant leaf patterns and diagnose the disease. Traditional method consumes more time, tedious work for labours. In big farm lands, early stage detection of plant disease by using automated techniques will reduce the loss in productivity. In this paper, we propose a vision based automatic detection of plant disease detection using Image Processing Technique. Image processing algorithms are developed to detect the plant infection or disease by identifying the colour feature of the leaf area. K mean algorithm is used for colour segmentation and GLCM is used for diseases classification. Vision based plant infection showed efficient result and promising performance.

Monika Gupta (2018) et al. proposed farming is an ancient occupation practised in India since the ancient period. In India, especially in rural areas 70% of people depend on agriculture. These agriculture crops can be affected by various pathogens, fungus, bacteria and viruses which reduce the quantity and quality of the products intern reducing its production. If the agricultural production decreases, the total economy will be affected. Mostly the leaves show symptoms of the disease in the plant. The traditional method of recognizing the disease in plants is through naked eye. Minute variations in the infected leaves through perception of human eye cannot be predicted accurately. Hence new methodologies and techniques have evolved for detection of disease in the plants. Detecting the

disease in its early stage is necessary to help farmers control the disease in plants. In recent decades Digital Image processing, Image analysis technologies have been rapidly increased. Applying image processing techniques to the images of disease affected leaf it is easy to detect the disease in the plant. Using MATLAB software provides software solution for automatic disease detection and classification of affected leaf.

Saradhambal. G (2018) et al. proposed crop cultivation plays an essential role in the agricultural field. Presently, the loss of food is mainly due to infected crops, which reflexively reduces the production rate. To identify the plant diseases at an untimely phase is not yet explored. The main challenge is to reduce the usage of pesticides in the agricultural field and to increase the quality and quantity of the production rate. Our paper is used to explore the leaf disease prediction at an untimely action. We propose an enhanced k-mean clustering algorithm to predict the infected area of the leaves. A color based segmentation model is defined to segment the infected region and placing it to its relevant classes. Experimental analyses were done on samples images in terms of time complexity and the area of infected region. Plant diseases can be detected by image processing technique. Disease detection involves steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification. Our project is used to detect the plant diseases and provide solutions to recover from the disease. It shows the affected part of the leaf in percentage. We planned to design our project with voice navigation system, so a person with lesser expertise in software should also be able to use it easily.

Gharte Sneha H. (2019) et al. proposed a task for producing agricultural products, various micro-organisms, pests and bacterial diseases attack on plants. These diseases can occur through the leaves, steams or fruit inspection. This paper covers technique of image processing for early detection of plant disease through feature extraction of leaf and preprocessing of image from RGB (YCbCr) to different color space conversion, image enhancement; segment the region of interest and minimum distance classifier is used. The detection of plant leaf disease is very difficult role. Many of the plant diseases are caused by bacteria, fungi, and viruses. An automatic detection of plant disease is a necessary topic. Computer vision techniques are used to discover the affected spots from the image through an image processing capable of recognizing the plant area is detailed in this paper. The achieved accuracy of the overall system is 90.96%, in line with the experimental results. Matlab software is used to detect plant leaf disease.

Monishanker Halder (2019) et al. proposed the smart city implies a global vision that merges artificial intelligence, big data, decision making, information and communication technology (ICT), and the Internet-of -Things (IOT). These processes above are related for solving real life problems. Food is one of the basic needs of human being. World population is increasing day by day. So it has become important to grow sufficient amount of crops to feed such a huge population. But with the time passing by, plants are affected with various kinds of diseases, which cause great harm to the agricultural plant productions. Beside that many countries economy greatly depends on agricultural productivity and it's also a need for a country to attain agricultural productivity of basic agricultural product for the people of that particular country. Detection of plant disease through some automatic technique is beneficial as it requires a large amount of work of monitoring in big farm of crops, and at very early stage itself it detects symptoms of diseases means where they appear on plant leaves. In this paper surveys on different disease classification techniques that can be used for plant leaf disease detection.

Conclusion:

The accurately detection and classification of the plant disease is very important for the successful cultivation of crop and this can be done using image processing. This paper discussed various techniques to segment the disease part of the plant. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaf and the classification of plant diseases. The use of ANN methods for classification of disease in plants such as self-organizing feature map, back propagation algorithm, SVMs etc. can be efficiently used. From these methods, we can accurately identify and classify various plant diseases using image processing techniques.

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