DETECTION OF PLANT DISEASES BY USING MATLAB

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Abstract

The term plant disease is usually used only for the destruction of live plants. If identification of plant disease is done visually, it not only consumes lot of labor but it is less accurate and could only be applied or used in selected parts of area. But if the same task is performed by technique which automatically detects diseased plant using image processing, the process becomes much more efficient, accurate and can perform the task in very less time as compared to visual detection. Most plant diseases are caused by fungi, bacteria, and viruses. Fungi are identified primarily from their morphology, with emphasis placed on their reproductive structures. Hence the present work is carried out to find out two plant fungal diseases viz., *Alternaria alternate* and *Anthracnose* its identification by MATLAB.

Key words: Plant disease, wireless sensor, Image processing, Alternaria alternate and Anthracnose

Introduction

India is blessed with a large cultivable land, but the output produced is not in acceptable range. This is due to improper management of water and disease control. The use of technology in the field of agriculture is helping us to overcome this problem [7]. First problem is water management which is rectified by use of proper irrigation method that suitable for cultivable land [2].   Second problem is disease which is rectified by detect that at earlier stage reduce spreading to near plant and also reduce the usage of pesticide [1& 4]. The continuous use of pesticide can reduce pest or disease increment but it reduces the quality of food. The naked eye observation of experts is the main approach adopted in practice for detection and identification of plant diseases. But, this requires continuous monitoring of experts which might be prohibitively expensive in large farms. Further, in some developing countries, farmers may have to go long distances to contact experts; this makes consulting experts too expensive and time consuming [5]. Automatic classification of leaf diseases is done based on high resolution multispectral and stereo images [6]; moreover farmers are unaware of non-native diseases. Automatic detection of plant diseases in an important research topic as it may prove benefits in monitoring large fields of crops, and thus automatically detect the diseases from the symptoms that appear on the plant leaves [7].

Plant disease

The occurrence of plant diseases may vary from season to season, depending on the presence of the pathogen, environmental conditions, and the crops and varieties grown. Some plant varieties are subject to outbreaks of diseases while others are more resistant to them. Every garden is prone to pests and diseases. Some organisms are harmless but the majority causes damage in plant's roots, leaves sometimes overall health. It is important to carefully check individual plants and also check some precautions for proper pest control. If it is not maintain properly, pests can destroy an entire crop i.e., it affects flowers, vegetables, and fruits [2]. Pest/ disease drastically reduce the overall quality of fruits and vegetables. Some of these harmful organisms have a chance to spread to neighboring crops. If it is not noticed leads to plant's death [3]. Ants, snails, caterpillars, spider mites, white flies, fungus are the most common types of garden pests. Pests are organisms which is harmful or damage to crop plants. Most of these organisms are insects or fungi. It is important to regularly check your plants for spreading diseases or any signs of pest damage. It is control by

making crop rotation; supply right nutrients at right time; supplying enough amount of water and check whether that plant get optimal condition for growth such as space, temperature.

Infectious plant diseases are caused by a pathogenic organism such as a fungus, bacterium, mycoplasma, virus, viroid, nematode, or parasitic flowering plant. Sometimes the combinations of all disease-causing agents that affect a plant make the disease complex [2]. If plant becomes continuously disturbed by pest or disease it results changes in physiological process such as changes in plant's normal structure, growth, function, or other activities. The continuously changes in physiological process, it is symptoms for disease infected. Hence the present work is carried out to find out two plant fungal diseases viz., Alternaria alternate and Anthracnose its identification by MATLAB.

Methodology

Disease detection requires knowledge in plant diseases and more processing time. Identification of plant growth at frequent interval is used for detection of disease at earlier stage. In olden days this process is done by manual, but sometime due to environmental changes prediction of disease is difficult. Technology play a vital role in all field. Introducing of automatic identification overcomes these difficulties. Image processing is method of identification of disease. In general symptoms of disease in plants are observed in leaf, stem, and flower.

The leaf image processing system is classified into two phases:-

(1) Training Phase - Which includes Image Acquisition, Image Pre-Processing, Feature Extraction and training

(2) Testing Phase - Which includes Test Image Acquisition, Test Image Pre-processing, Feature Extraction, K- means based Segmentation and Classification.

Disease detection involves 5 steps:

- Image acquisition- capturing the image through digital camera and stores it for MATLAB operation.
- Image pre-processing – involves changing image size and shape, filtering of noise, image conversion, enhancing image.
- Image segmentation - conversion of digital image into several segments for analysis. Use K-means clustering method for partitioning of images into clusters in which at least one part of cluster contain image of diseased.
- Feature extraction - color, texture, morphology and structure are extracted.
- Training & Classification- applying artificial intelligence technique for the discrimination of normal and abnormal leaves or the affected areas of leaves.

Using MATLAB, identification of disease involves loading the image, contrast enhancement, converting RGB to HSI, extracting and classification.

Result and discussion

Urbanization cause reduction of cultivable spaces and also drained some percentage of available water from farming. It resulted into growing wetland in cities, which become part of growing cities. Decrease in agricultural productivity can be due to a variety of reasons; damage caused by pests and pathogens plays a significant role in crop losses throughout the world and urbanization leads to convert the fertile agricultural land into residing places. In this paper mainly concentrate the pathogens identification in visual image process by MATLAB on two types of plant fungal diseases viz. *Alternaria alternate* and *Anthracnose*.

Alternaria alternate

Alternaria alternata is a water prone disease. It is a fungus which causes leaf spots, rots and blights on plant parts. *Alternaria alternata* needs a moist warm environment to survive. It is found in areas with humid climates area. The fungus lives in seeds and spread by spores. It is an opportunistic pathogen on numerous hosts causing leaf spots, rots and blights on many plant parts.   There are no insect vectors, so applying insecticides have no effect on a plant's resistance to this disease. Cultural practices for preventing this disease include planting plants in a row north to south. Using a drip irrigation system to keep as much as plant tissue in dry and free of favorable environments for this pathogen.

Anthracnose

Anthracnose is caused by fungi in the genus *Colletotrichum*, a common group of plant pathogens that cause diseases on many plant species. This fungal disease affects many plants, including vegetables, fruits,

and trees. Infected plants develop dark, water soaked lesions on stems, leaves or fruit. The centers of these lesions are covered with pink, gelatinous masses of spores especially during moist, warm weather. It is spread by wind, rain, insects and garden tools. It is easily spread by watering. Anthracnose can reduce a beautiful harvest into rotted waste in just a few days. It is prevented by water the plants with a drip emitter, hence less water at time cause unfavorable environment for it. By these means we can prevent these diseases by proper irrigation system to keep as much as plant tissue in dry and free of favourable environment for this pathology.

Fig. 1 Leaf infected by *Alternaria alternate*
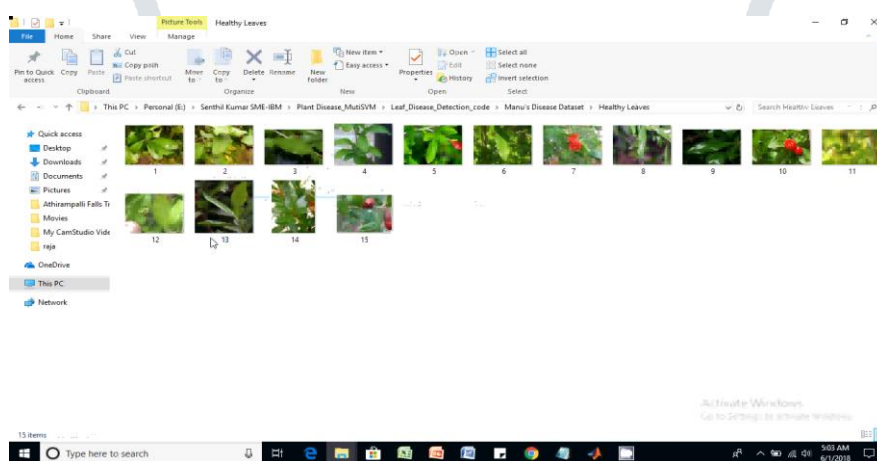

Fig. 2. Leaf infected by *Anthracnose*

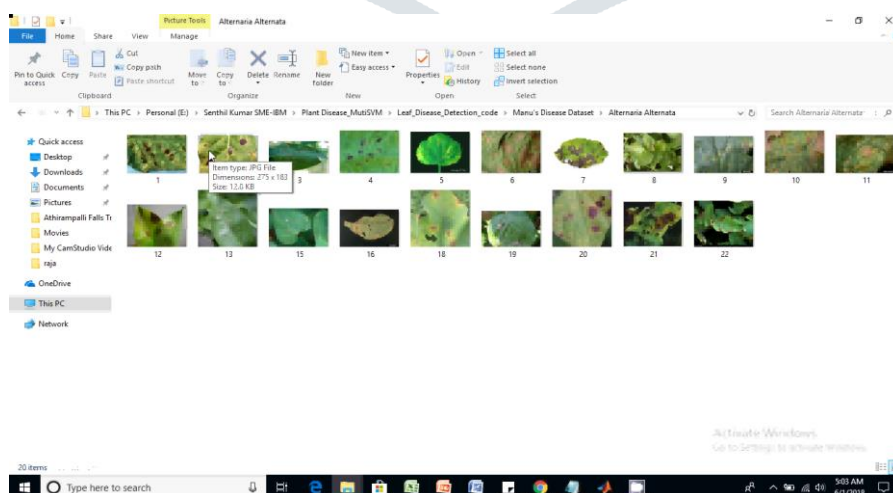Fig 3 : Different number of healthy image of plant leaf

Fig 4: Types of infection occur in leaf by *Alternaria alternata* and *Anthracnose* disease.

Conclusion

Agriculture is heart of our civilization. It is backbone of Indian economy which fulfills the basic need of human beings and animals. At present ground water level is reduced and managing scarcity of water has become a tedious job. The Crop disease causes losses in yield. Now a day's science and technology plays vital role in everywhere but still in agriculture we are following olden method. Farmers are facing many problems for getting better yield. So it is need of introducing technology in agricultural field to manage use of water and protection of crop from disease. The implementation of a wireless sensor network for monitoring and controlling the parameters in the agricultural environment from the remote place by the farmers is useful. Wireless monitoring of field not only allows us to reduce the human activity, but it also allows us to see accurate changes in it. It is the cheapest and effective method in water and pest management. Hence use of technology help us getting right amount of crops at right time by measuring parameters such as weather, temperature, soil moisture at frequent interval of time. It also helps us to identify and detect the types of disease at earlier stage. Hence this system will help farmer to maximize their benefits.

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