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Crop Disease Detector using Drone and MATLAB

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Abstract - *The world population is increasing rapidly so that it is need to provide large quantity and good qualitative food, so role of agriculture field plays a vital role in it. Main aim of this work is not only to detection of bio-aggressors on plant leaves but as early as possible. Now days the techniques of machine vision and digital image processing are extensively applied to agricultural science and it has great perspective especially in the plant protection field, which ultimately leads to crops management.*

The dissertation proposes a software prototype system for pest detection on the infected images of different leaves. Images of the infected leaf are captured by digital camera and processed using image growing, image segmentation techniques to detect infected parts of the particular plants. Then the detected part is been processed for further feature extraction which gives general idea about pests. This dissertation proposes automatic detection and calculating area of infection of black sigatoka at a mature stage on a banana tree and whitefly on rose and cotton crop by an application of cognitive vision techniques.

INTRODUCTION

Agriculture in India has a significant history. Today, India ranks second worldwide in farm output. Agriculture and allied sectors like forestry and fisheries accounted for 16.6% of the GDP in 2012, about 50% of the total workforce. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India.In India, agriculture is the main occupation. Nearly 70% of people in India have their main occupation as agriculture. The major cash crops are sugarcane, cotton, citrus, groundnut, tobacco, potato, coffee, tea, cashew nut, mango, grapes, oranges, various kinds of vegetables and flowers etc. Besides this major crops are sorghum, wheat, rice, maize, millets and many legumes are also cultivated on large scale as they have increasing market value but the most important natural enemies of agricultural crops are insects, plant diseases, weeds and weather conditions.

PROBLEMS FACED IN AGRICULTURE

A number of pathogens cause diseases in crop plants and domesticated animals. Such pathogens cause damage to them. This finally results in economic loss to the farmer in their yield. Crop pest prevention and control, as well as actual yield loss, account for a large proportion of the annual monetary cost experienced by producers. Pests affect the crop in various ways, including decreasing photosynthetic capacity; competing for water, nutrients, and light; causing a loss of plant tissue; or initiating premature death. Although the possible causes of decreased crop health and growth are many, the majority of the problems are common and easily recognizable. These problems should always be considered and eliminated first. Knowledge of some primary pests of field crops, as well as some common characteristics of all pests, can assist a crop scout or producer in narrowing down the cause of a problem and in finding a solution as quickly as possible

True automatic voltage stabilizers essentially consist of two units, called the measuring unit and the regulating unit. The function of the measuring unit is that of detecting a change in the input or output voltage of the automatic voltage stabilizer and producing a signal to operate the regulating unit. The purpose of the regulating unit is that of acting, under the signal from the measuring unit, in such a

INVENTION OF TECHNOLOGIES IN AGRICULTURAL FIELD

The agricultural market is evolving from being mechanized in the 20th century, with still larger machines to being automated in the 21st century. There is a growing market for more cost effective, environmentally friendly and task optimized systems, saving resources like diesel and pesticides.

High accuracy in field operations is a prerequisite to optimize output and quality of the crops, as well as minimizing the production cost. In order to fulfill these requirements, more and more automation is introduced. Development of automation technology for agricultural machinery has many aspects. As a high degree of automation is required, it is important that machine manufacturers consider automation in the early design stages of mechanics and electronics. It is vital that manufacturers provide the required interfaces, enabling automation and optimization of the entire product and not just of the individual sub-components. As the degree of automation increases the complexity of the automation tasks will rise. This report focuses on the sensor subsystem and more specifically computer vision technology.

Computer vision technologies have enabled manufacturers to automate a wide range of tasks. However, even though computer vision technology has developed in general, special efforts are required to make such complex technology robust and mature, to meet the high demands required by modern farmers. Computer vision methods are easier to apply in our system we simply use a consumer electronics scanner to get high-resolution images of leaves. Computer vision has a wider field of application such as disease and pest control. It has been applied in respectively, to quantify symptoms various pests attacks, or in to develop an automated plant monitoring system in greenhouses.

FIELD VISIT

To know more about the pests and their effect on different greenhouse plants and agricultural crops visited Dr. Panjabrao Krishi Vidhyapeeth, Akola, Several cotton and banana farms, for study of PRSV disease some papaya field and Jain Irrigation, Jalgaon.

Jain Irrigation, Jalgaon

Jain Irrigation is a leading organization in the field of green house cultivation. It is situated in Jalgaon. Here we can find the most advanced greenhouses in India. At Jain Irrigation Jalgaon I got the guidance of Mrs. Kalyani Moharir which is the incharge of the greenhouse department. She guided about the effect of environmental factors like temperature, humidity etc on the growth of crops as well as on the pests.

Some Photographs of the visit are given below. Figure 2.2 on next page shows some photographs of greenhouses, storage house and weather station situated in Jain hills near of village Shirsoli, Jalgaon. And some photographs of field visit on several cotton farms are shown in Figure

Figure. Some Captured Photographs of Jain Irigation, Jalgaon

PERFORMANCE ANALYSIS

This project is implemented using MATLAB image processing toolbox.

The proposed work has mainly following steps:

- Image acquisition
- Background subtraction
- Filtering
- Segmentation/ Edge Detection
- Feature extraction

Image Processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to-day life for various applications. Image Processing systems are becoming popular due to easy availability of powerful personnel computers, large size memory devices, graphics softwares etc.

The output of image processing may be either an image or, a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two- dimensional signal and applying standard signal processing techniques to it. An image is an array, or a matrix, of square pixels (picture elements) arranged in columns and rows.

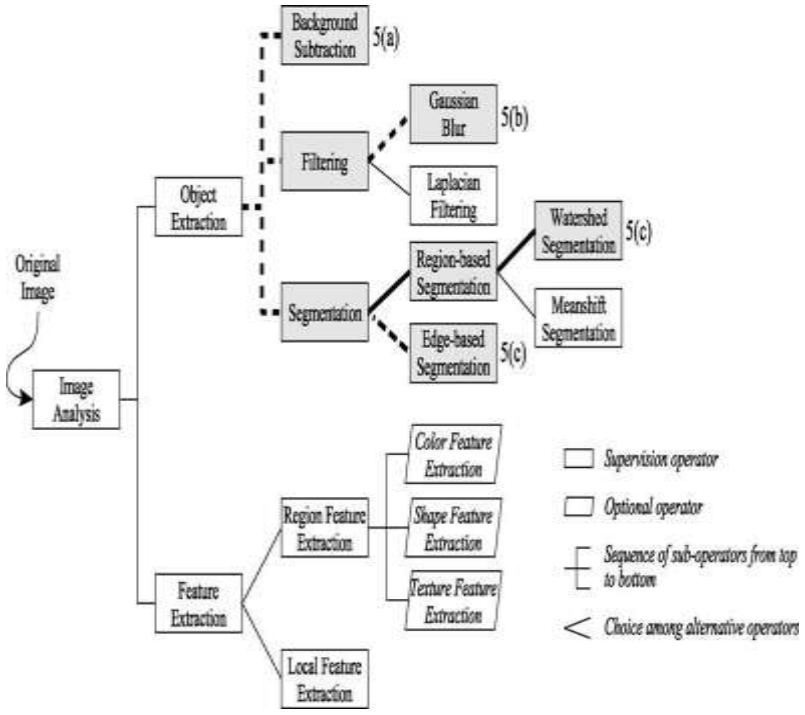

Figure: Flow of a Image Processing.

Figure shows the flow of image processing. Object extraction is followed by feature extraction. Object extraction itself decomposes into a sequence background subtraction, then filtering, and finally segmentation). Since background subtraction appears on the top and corresponds to a concrete program to excute, the system invokes it. This program automatically extracts a leaf from its background image. The second sub-operator, filtering may be performed in several different ways(Gaussian, Linear, Low pass, High pass, Median or Laplacian filtering). It runs the corresponding denoising program and the result is presented in .The next operator, segmentation, also corresponds to a choice between two alternative sub-operators: region-based and edge-based. We preferred edge detection of it. Similarly, once the objects extracted, the second step of image analysis, feature extraction, computes the attributes corresponding to each region, according to the domain feature concepts (e.g., color, shape and size descriptors). In this example, it appears to be shape feature extraction. Finally, through this we get the information about pests and its features which is useful data for the preventive measures that has to be undertaken.

Conclusion

Moreover, cognitive vision detects whiteflies three times faster and it covers three times more leaf surface. The context of this work is to automate operations in greenhouses and agriculture field as well. Our goal is rather to better spot the starting points of bio-aggressors attacks and to count these latter so that necessary action can be taken. In this dissertation range of infection has been decided by considering cotton crop into a mind. From these observations finally we can say that this proposed technique is very good for early pest detection on agricultural crops as well as for green house crops. Statistics said

it is fully trustworthy and can be possible to implement at a root level. But still all modern techniques are found to be somewhat incomplete; it requires support of ancient or says traditional method as well for its better performance and problem solution. Vedic text will definitely provides proper way and guidelines for it.

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