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E-Mail
editor.ijmece@gmail.com
editor@ijmece.com

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EARLY PEST DETECTION FROM CROP USING IMAGE PROCESSING AND COMPUTATIONAL INTELLIGENCE

Dr. A. Ramaswami Reddy,

ABSTRACT:

Early pest detection is a major challenge in agriculture field. The easiest way, to control the pest infection is the use of pesticides. But the excessisive use of pesticides are harmful to plants, animals as well as human beings. Integrated pest management combines biological and physical methods to prevent pest infection. The techniques of machine vision and digital image Processing are extensively applied to agricultural science and it have great perspective especially in the plant protection field, which ultimately leads to crops management. This paper deals with a new type of early detection of pests system. Images of the leaves affected by pests are acquired by using a digital camera. The leaves with pest images are processed for getting a gray colored image and then using feature extraction, image classification techniques to detect pests on leaves. The images are acquired by using a digital camera . The images are then transferred to a PC and represented in MATLAB software. The RGB image is then converted into gray scale image and the feature extraction techniques are applied on that image. The Support Vector Machine classifier is used to classify the pest types.

INTRODUCTION

India is an agricultural country. 70 percent of the people mainly depends upon agriculture. So increasing the productivity of crops is an important matter now. Most of the scientists are doing their researches on this field. By using their new techniques and practical implementations this is very easy. But one of the most important problem now exists is „pest infection" on plants. This paper mainly focuses on greenhouse crops. There are different crops cultivated under greenhouse. for example, vegetables like cucumber, potato, tomato etc and flower plants like rose, jasmine etc. The most common pests which will affect on this green house crops are whiteflies a, aphids and thrips. One way to control the pest infection is by using the pesticides.

Professor, Dept. of CSE,
Malla Reddy Engineering College (Autonomous), Secunderabad, Telangana State

Pesticides will suppress particular species of pests. Pesticides are detrimental for the environment and produce considerable damage to eco systems.

The excessicive use of pesticides will pollute air, water, and soil. Carried by the wind pesticides suspensions contaminate other areas. In this paper, we focus on early pest detection. This implies to regular observation the plants. Images are acquired using cameras. Then the acquired image has to be processed to interpret the image contents by image processing methods. The focus of this paper is on the interpretation of image for pest detection.

Literature survey

In this section we will discuss some methods which are presently used for the early detection of pests in greenhouse crops along with their advantages and disadvantages. The methods are explained below with their features and drawbacks.

Detection of Pests Using Video Analysis

This work combines image processing techniques as well as knowledge based technique[1] .It will detect only whiteflies. The resulst of this system are more reliable and accurate than that of the manual methods. This is actually a multidisciplinary cognitive vision system that combines different types of techniques like computer vision , artificial intelligence, image processing etc. In this work, they chose rose plant as the testing crop and white fly as the pest for testing. The early stage of detection was quite difficult. So they chose adult flies. But some problems were there in detection of adult also. The adult may fly away during the image capturing time. So they chose to scan the leaves of rose when flies were not active. The future scope of the work is to detect whiteflies in its early stage.

Method which use Sticky Traps

The goal of Detection of insects by a video camera network[2] is to detect the pest infection on leaves by using a video analysis. The traditional methods will take more time to detect and count the pests. Because of this reason they have developed an automatic system based on video

analysis. They used 5 wireless cameras in greenhouse. They chose rose as a crop for testing . sticky traps are used in this work. Sticky traps are nothing but a sticky material which is having some colours to attract the pests. For the detection of insects, they used video segmentation algorithms with learning and adaptation techniques. The adaptive system can be used in any weather conditions. The future scope of this system is to detect new types of pests in early stage.

PROBLEM STATEMENT :

In most cases, computer vision, machine learning, or deep learning technologies are selected and used to detect plant diseases, but the comparison of the different possible techniques in the same work is not usually found; instead, normally a single approach is selected. Many works on automatic pest detection and identification are focused on a specific selected technological approach , but different technological solutions are not tested. Computer vision and object recognition made huge advances in last years. Large Scale Visual Recognition Challenge (ILSVRC) based on the ImageNet public dataset has been used as benchmark for different visualization-related problems in computer vision, including object classification and object identification. Previously, the traditional approach for image classification tasks has been based on features detection algorithms, such as DoG, Salient Regions, SURF, SIFT, MSER, etc. . When features are extracted, some learning algorithms are used with these features.

MODULES:

Upload Pest Dataset:

Using this module we will upload dataset to application

Preprocess Dataset:

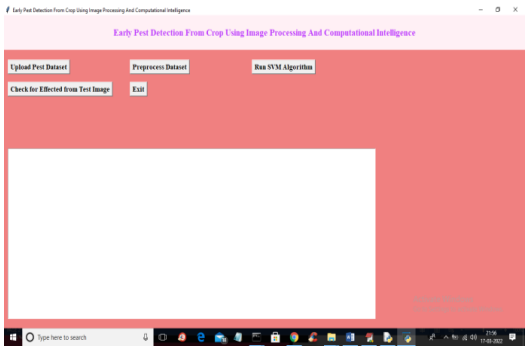
Using this module we will acquire images from dataset and then filter images to grey colour and then normalize images and then split dataset into train and test part where application use 80% images for training and 20% for testing

Run SVM Algorithm:

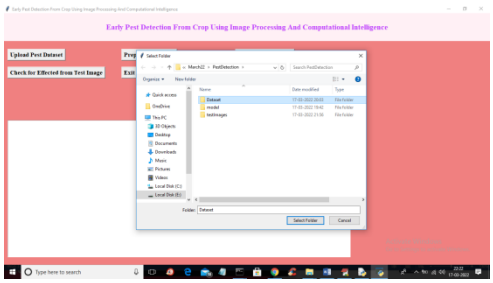
process images will be input to SVM algorithm for training and then calculate its prediction accuracy.

Check for Effected from Test Image:

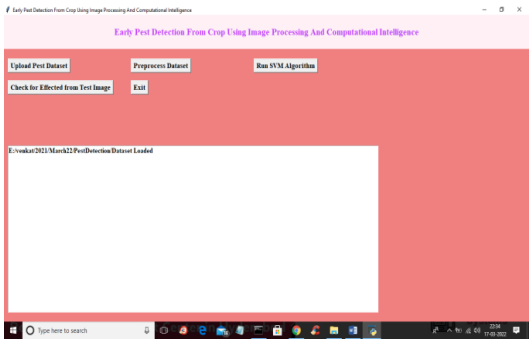
Using this module we will upload test image and then SVM will predict type of pest as Aphid, White fly or Uneffected.



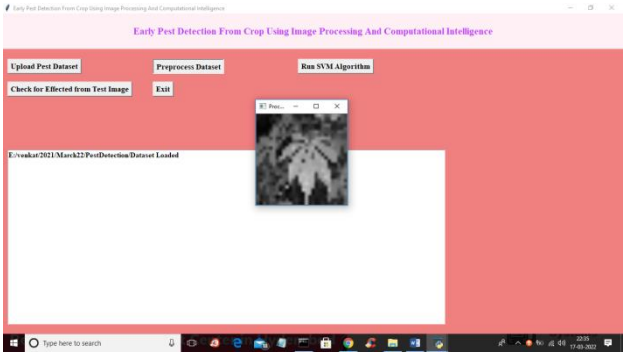
In above screen click on 'Upload Pest Dataset' button to upload dataset and to get below screen



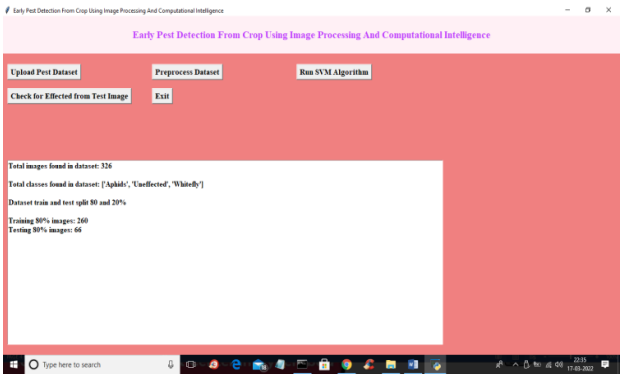
In above screen select and upload 'Dataset' folder and then click on 'Select Folder' button to load dataset and to get below screen



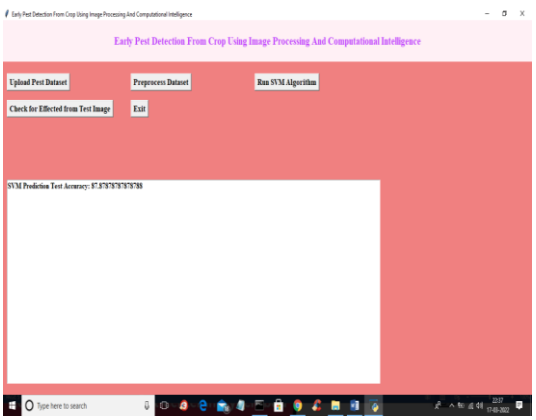
In above screen dataset loaded and now click on 'Preprocess Dataset' button to read and normalize images and then split dataset into train and test part.



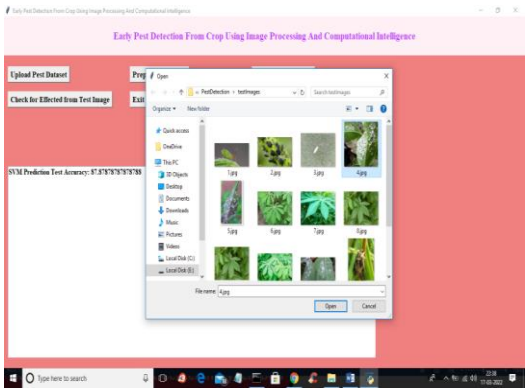
In above screen displaying processed grey image and now close above image to get below screen



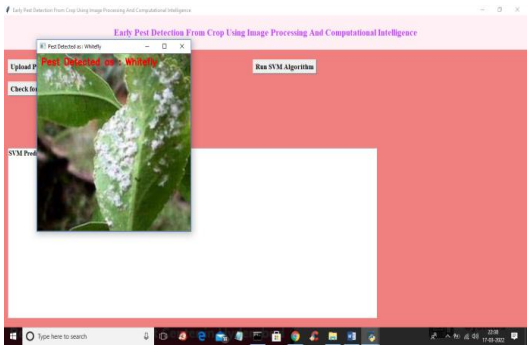
In above screen we can see number of images and classes found in dataset and now click on 'Run SVM Algorithm' button train SVM with processed images and then calculate it's prediction accuracy



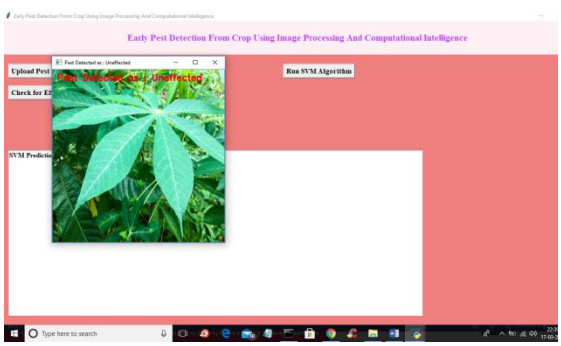
In above screen with SVM we got 87% prediction accuracy and now click on 'Check for Effected from Test Image' button to upload test image like below screen



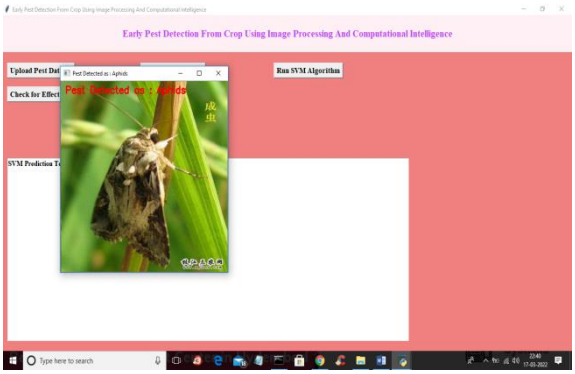
In above screen selecting and uploading 4.jpg file and then click on 'Open' button to get below output



In above screen in red colour text we can see SVM predicted/classified uploaded image as 'whitefly' and similarly you can upload and test other images



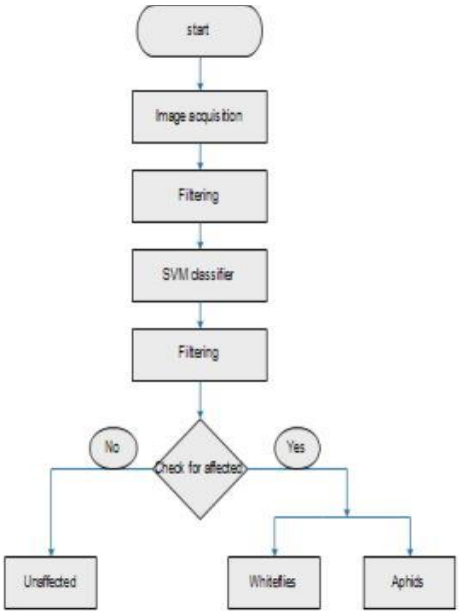
In above screen uploaded image is predicted as 'Uneffected' as it not contains any pest.



In above screen uploaded image is classifier as 'Aphids'

FLOWCHART

Flowchart for the proposed system is given in figure 3. The images are acquired by using camera and it is filtered by using bicubic filters to avoid unwanted noise portions. This is actually the image preprocessing step. The next step is svm classification to detect the pest infection. If the image is affected, then again it is applied to the svm to detect the type of pest



CONCLUSION

Image processing technique plays an important role in the detection of the pests. Our first objective is to detect whiteflies, aphids and thrips on greenhouse crops. We propose a novel approach for early detection of pests. To detect objects we use pan tilt camera with zoom. So without disturbing the pests we are able to take the image. It illustrates the collaboration of complementary disciplines and techniques, which led to an automated, robust and versatile system. The prototype system proved reliable for rapid detection of pests. It is rather simple to use and exhibits the same performance level as a classical manual approach. Our goal is to detect the pests as early as possible and reduce the use of pesticides.

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