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EARLY PEST DETECTION FROM CROP USING IMAGE PROCESSING AND COMPUTATIONAL INTELLIGENCE

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ABSTRACT

An important problem in agriculture is the early detection of pests. Using pesticides is the simplest technique to control the bug infestation. Yet, excessive pesticide use is bad for both people and animals and plants. Biological and physical methods are used in integrated pest control.ways to avoid being infected by pests. The methods of digital image processing and machine Processing is widely used in agricultural research, and it offers excellent prospects, particularly in the field of plant protection, which finally results in crop management. This study examines a novel approach to pest early detection systems. A digital camera is used to take pictures of the pest-infested leaves. In order to detect pests on leaves, the pest-imaged leaves are processed to create a grayscale image before being subjected to feature extraction and image classification techniques.Digital cameras are used to capture the photographs. After that, the photographs are uploaded to a computer and represented using Python software. The grayscale image created from the RGB image is then processed using feature extraction methods. The different sorts of pests are categorized using the Support Vector Machine classifier.

1 INTRODUCTION

Agrarian India is a nation. Agriculture is the main source of income for 70% of the population. Hence, increasing crop productivity is a crucial issue right now. the majority of scientists are their study in this area. This is quite simple to do by utilizing their innovative approaches and realistic applications. Yet, one of the most significant issues at the moment is "pest infestation" on plants. The primary subject of this essay is greenhouse crops. A greenhouse is used to raise a variety of crops. For instance, fruits and vegetables like tomatoes, cucumbers, and potatoes, as well as rose and jasmine bushes. The whiteflies, aphids, and thrips are the most frequent pests that will harm these greenhouse crops. Using insecticides is one method of containing the pest infestation.Certain pest species will be controlled with pesticides. Pesticides have a negative impact on the environment and seriously harm ecosystems. Pesticide abuse will contaminate the air, water, and soil. Pesticide suspensions that are carried by the wind pollute other places. We concentrate on early pest detection in this paper. This means that the plants are regularly observed. Cameras are used to capture images. The acquired image must then be analyzed using image processing techniques to decipher its information. The interpretation of photographs for pest identification is the main topic of this essay.

2. RELEATED WORK

In this section, we'll go through a few current techniques for spotting pests in greenhouse crops early, along with their benefits and drawbacks. The methods are described below along with advantages and disadvantages.

Detection of Pests Using Video Analysis

This work blends knowledge-based methodologies and image processing methods[1]. It will only pick up whiteflies. Compared to manual approaches, this system's outcomes are more trustworthy and accurate. This system incorporates various sorts of technology, including computer vision, artificial intelligence, image processing, etc. It is actually a multidisciplinary cognitive vision system.

In this study, they used white fly as the test pest and rose plant as the test crop. It was challenging to detect anything in the early stages. They decided on adult flies. Yet, there were some issues with identifying adults as well. The adult could take off while the photo is being taken. So they decided to scan the roses' leaves when the flies were dormant.

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Method which use Sticky Traps

The purpose of Detection of insects by a video camera network[2] is to use video analysis to find pest infestation on leaves. Pest detection and pest count will take longer using conventional methods. They have created an automated system based on video analysis for this purpose. Five wireless cameras were utilized in the greenhouse. They decided to test a crop of roses. In this work, sticky traps are utilized. Sticky traps are nothing more than a sticky substance with added colors to entice pests. They employed video segmentation algorithms with learning and adaptive strategies for the detection of insects. Any weather can be used with the adaptable system.

3 Implementation Study

With this module, we will upload the dataset to the application.

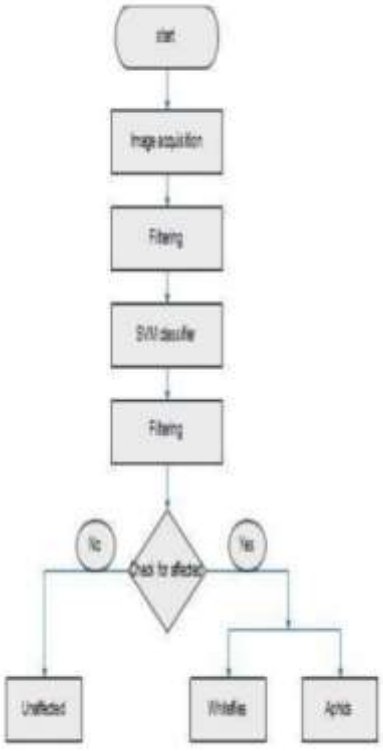
2) Preprocess Dataset: With this module, we will gather images from the dataset, filter them to a grayscale color, normalize them, and then divide the dataset into train and test parts, with 80% of the images used for training and 20% for testing.

3) Run the SVM algorithm: process photos will be fed into the SVM algorithm for training, and its prediction accuracy will then be determined.

4) Check for Effected from Test Image: With the help of this module, we upload a test image, and SVM determines whether it contains Aphids, White Flies, or Uneffected pests.

4 **PROPOSED WORK AND ALOGRITHAM**

Since this pest needs to be identified and treated quickly in order to avoid lasting infection, whiteflies and aphids were used for this investigation. The pan tilt camera with zoom is used to collect samples in the greenhouse, as shown in Fig. 1. The local machine receives the acquired images, and image processing methods are applied.



5 METHODOLOGIES

Image capturing

Image acquisition, often known as image capturing, is the first stage in every image processing application. The camera is used to take pictures of the leaves, which are then saved in formats like.PNG,.JPG, and.JPEG.

Image pre-processing

The acquired image is improved and made more aesthetically pleasing via image preprocessing. The system's picture preparation processes are:

1) Converting an RGB image to a gray image

2) Resize the picture

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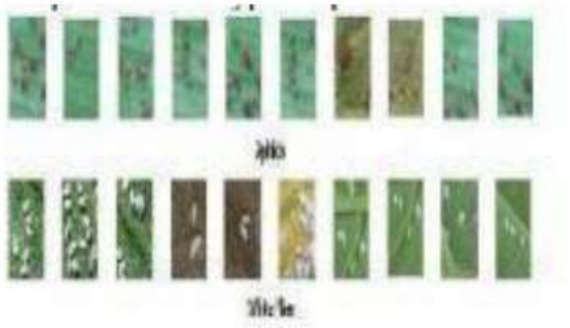
3) The image is filtered.
a) Conversion of RGB to Gray Image
Each color is represented by its red, green, and blue fundamental spectral components in the RGB color model. Red, green, and blue make up the three colors that make up a pixel (RGB). The drawbacks of RGB models are that they take longer to process and demand a lot of storage space. So, it is necessary to transform from the RGB model to the Gray model.
b) Resizing of the Image
In the RGB color model, each color is represented by its red, green, and blue fundamental spectral components. The three colors that make up a pixel are red, green, and blue (RGB). The downsides of RGB models are that they require a lot of storage space and are longer to process. Hence, a conversion from the RGB model to the Gray model is required.
c) Filtering of the image
Filtering is nothing more than removing the undesirable elements from the image. There are numerous sorts of filters. Low pass filters smooth out signals by letting only low frequency ones through while blocking all high frequency ones. Sharpening filters, high pass filters will filter out all low frequency impulses while passing only high frequency ones. Band pass filters allow signals with a certain frequency range to pass through. We use a smoothing filter in our system. Smoothing is used to remove noise and enhance the image's visual quality. While temporal images are exclusively applied to dynamic images, spatial filters are applied to both static and dynamic images. The average filter is the most straightforward smoothing filter.
3) Feature Extraction
The crucial aspect of this project is feature extraction. Here, a few attributes of the photographs are taken into account. Region attributes, gray covariance matrix properties, and other types of properties are among the several categories. Standard deviation, entropy, contrast, and other attributes are taken directly from the image and utilized to train the dataset for SVM classification. For binary classification, Support Vector Machines (SVMs) are a relatively new learning technique. The main goal is to identify a hyperplane that perfectly divides the two groups of d-dimensional data. The table below is a list of the various types of attributes that an image can have.

TABLE I: PROPERTIES OF AN IMAGE

Mean	Returns the mean value of the elements along different parameters of an array
Standard Deviation	Computes the standard deviation of the values in matrix.
Contrast	Returns a measure of intensity contrast between pixels.
Energy	Returns the sum of squired elements in the glcm.
Filled Area	Scalar specifying the number of pixels in filled area

Detection and Classification

Using the dataset made available by the SVM, the affected and unaffected photos are compared in this module. If the image is still impacted, the second dataset offered by the SVM is used for comparison. This comparison allows for the identification of the pest type.



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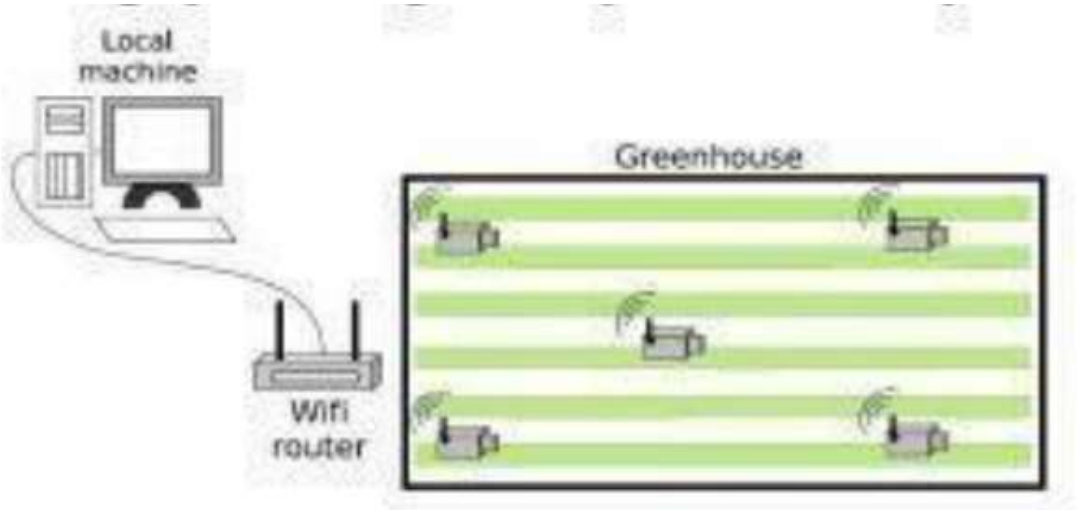

Fig. 1: propose Architecture

6 RESULTS AND DISCUSSION

SCREENSHOTS

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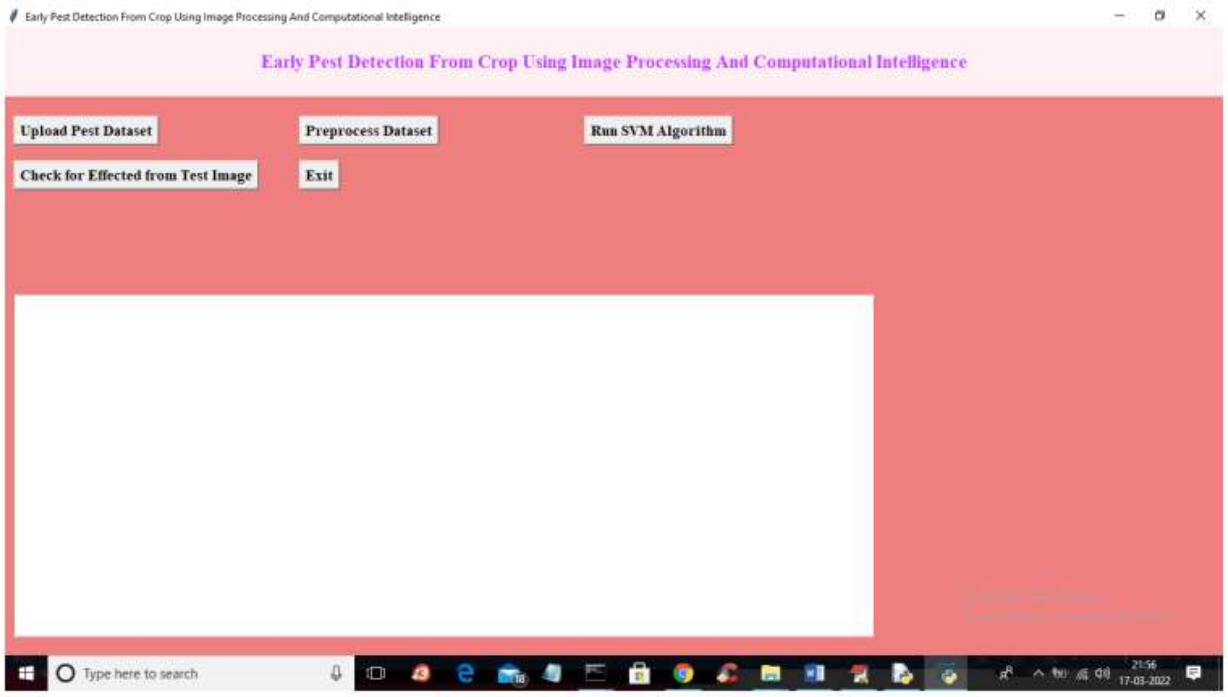
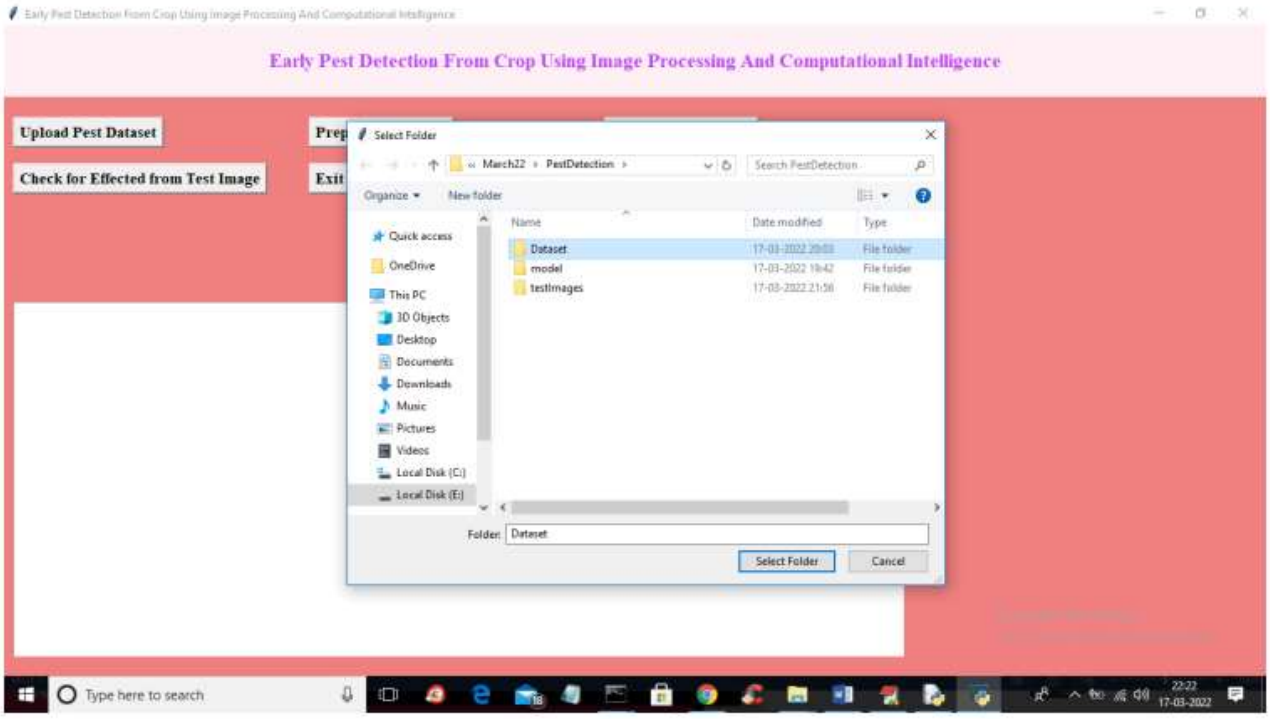


In above screen click on 'Upload Pest Dataset' button to upload dataset and to get below screen



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

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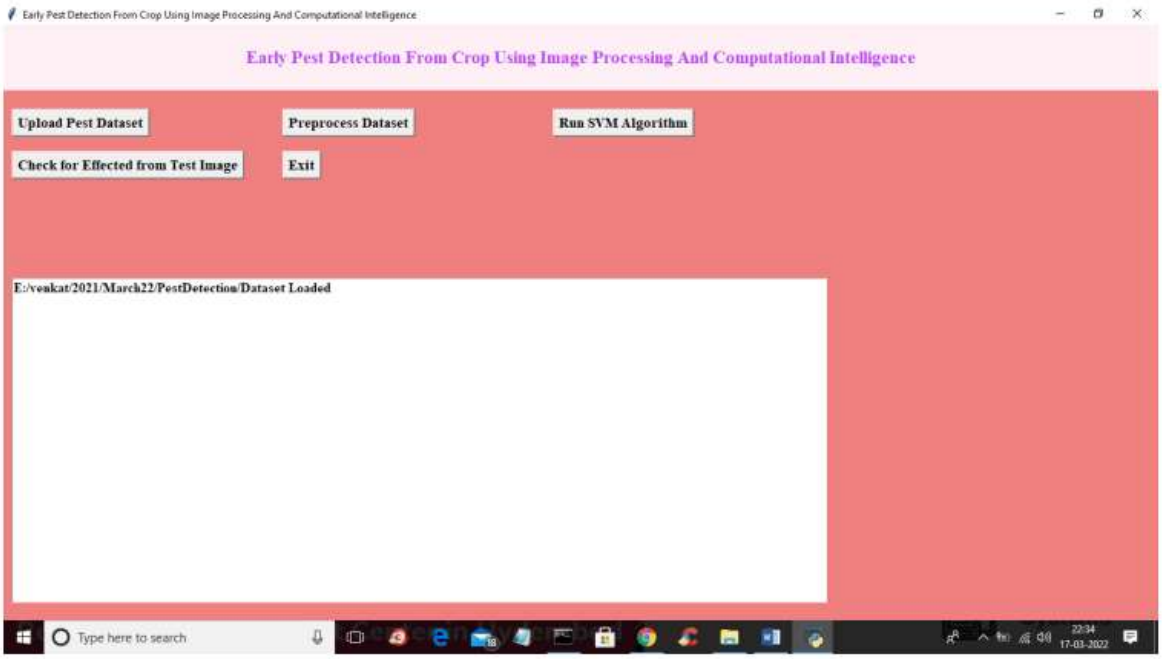
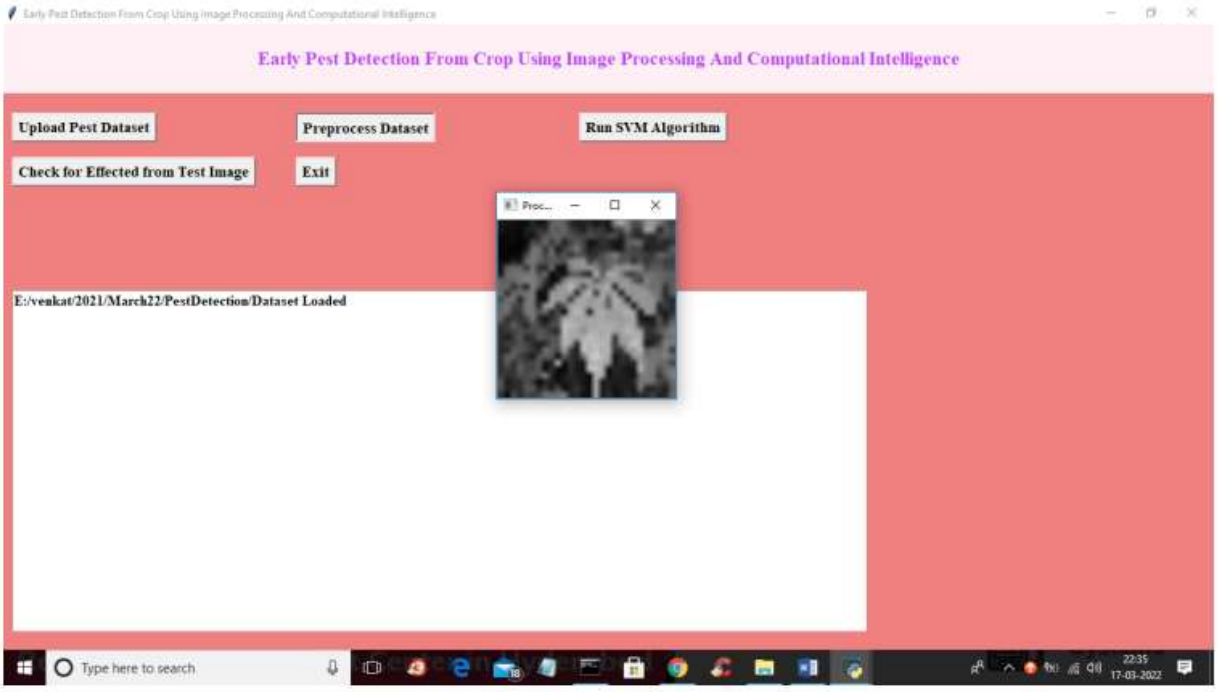


In the above screen dataset is loaded and now click on 'Preprocess Dataset' button to read and normalize images and then split dataset into train and test parts.



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

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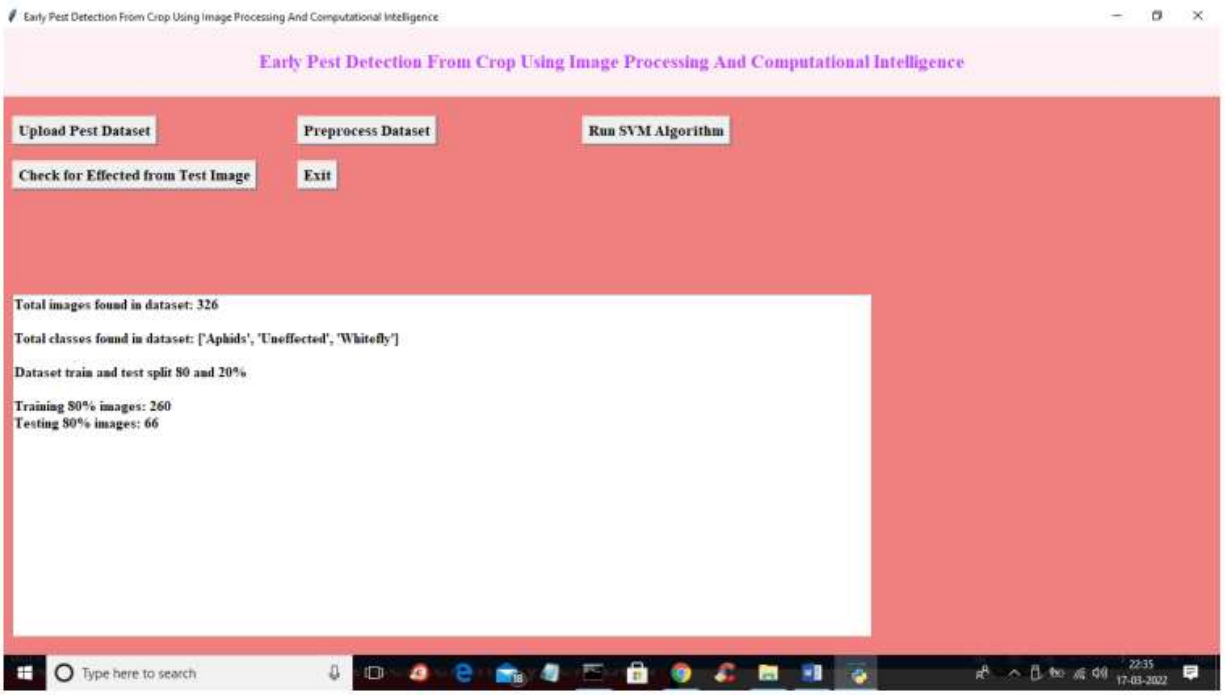
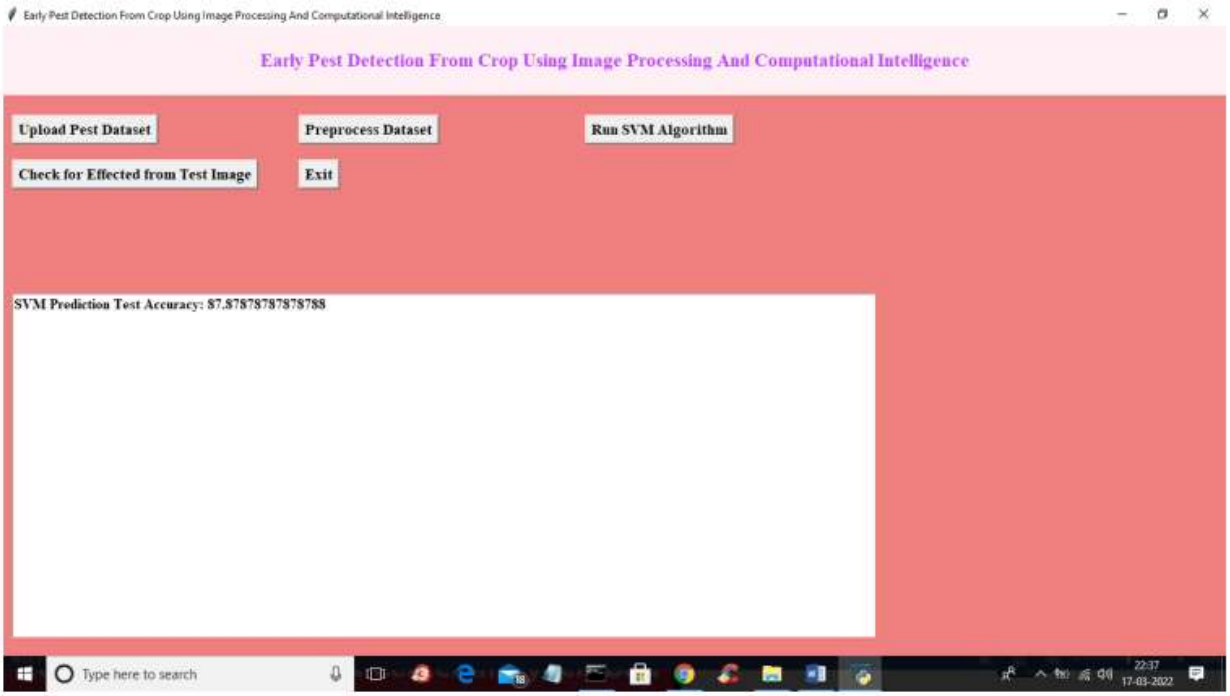


In above screen we can see number of images and classes found in dataset and now click on 'Run SVM Algorithm' button train SVM with processed images and then calculate it's prediction accuracy



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

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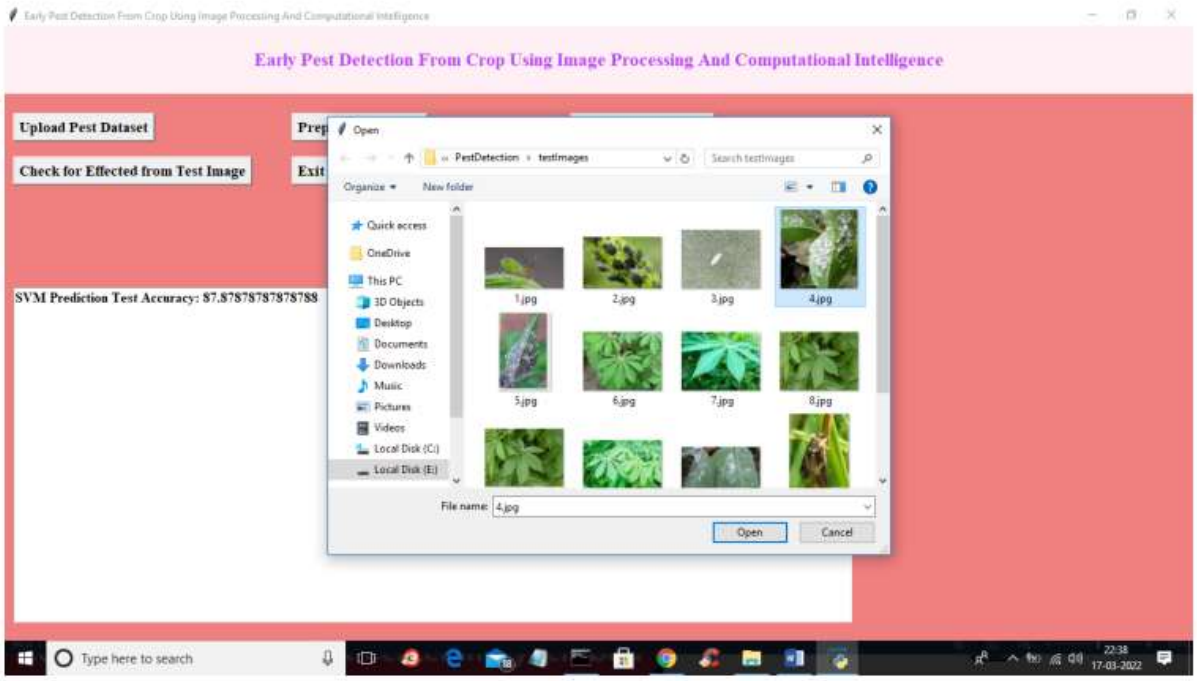
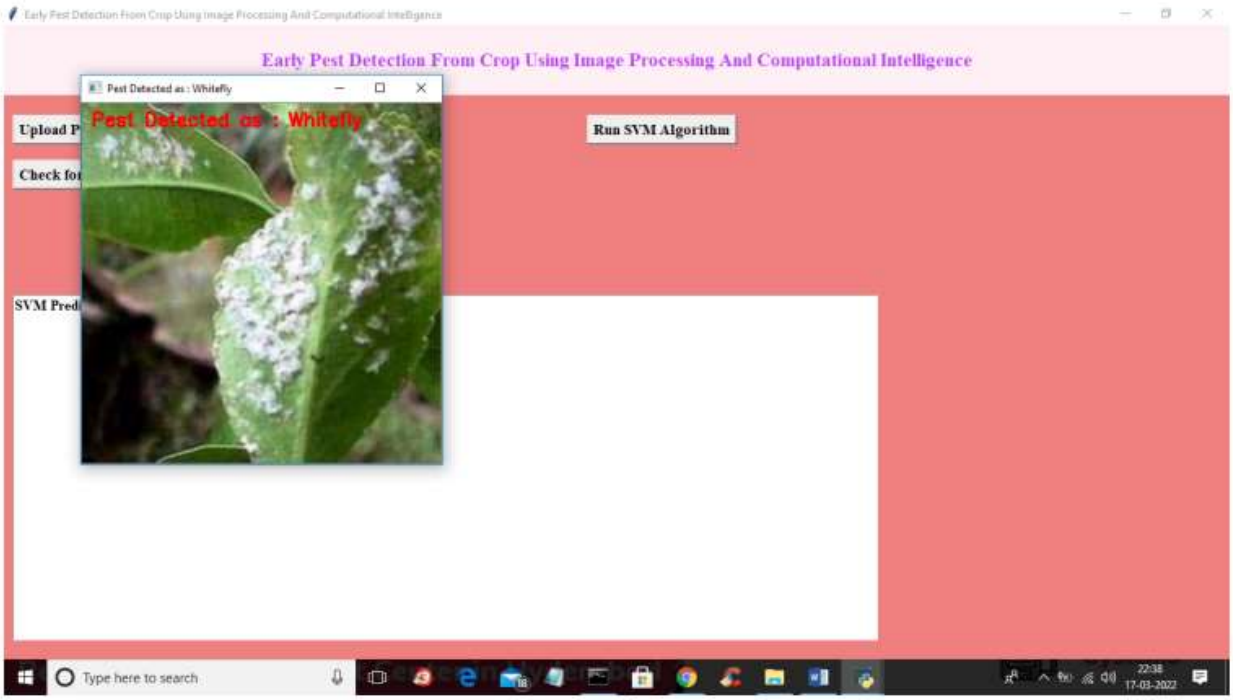


In above screen selecting and uploading 4.jpg file and then click on 'Open' button to get below output



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

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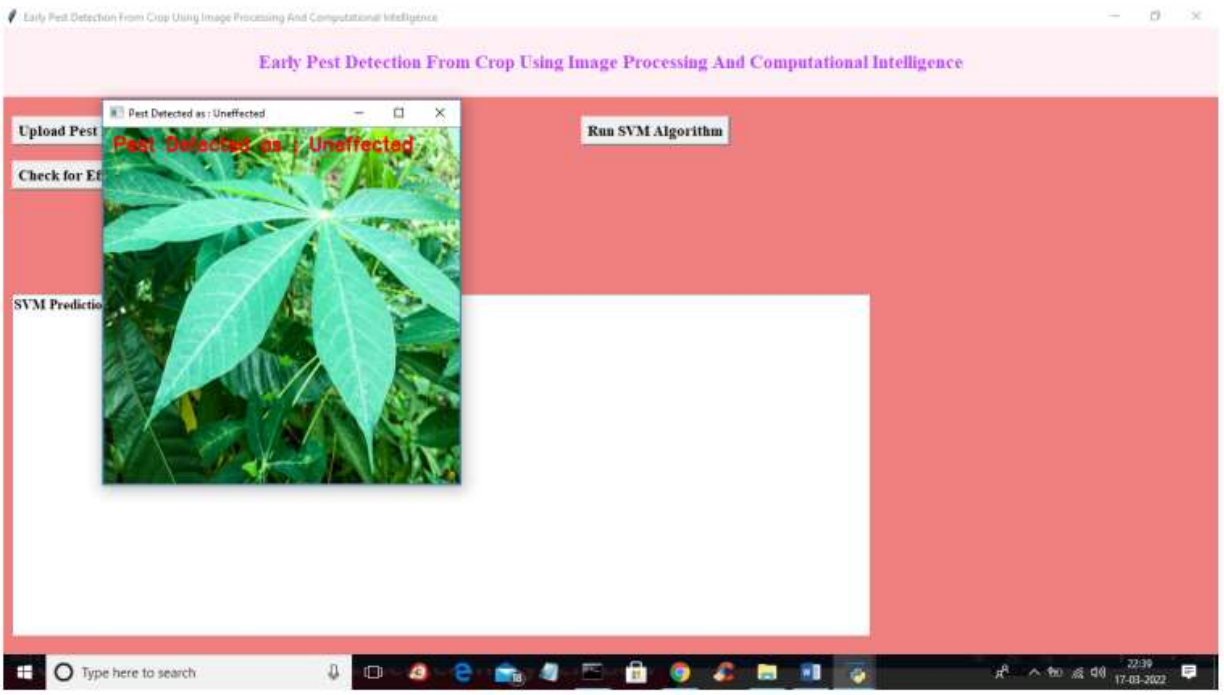
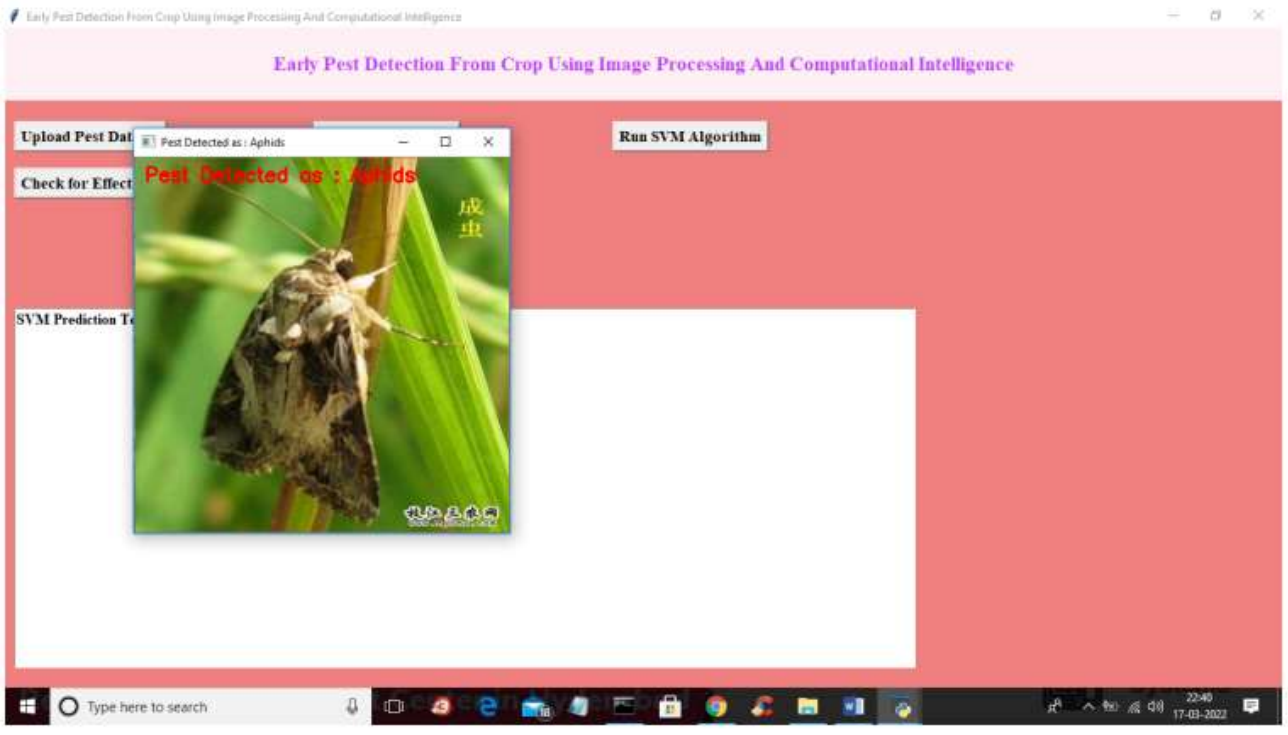


The above screen uploaded image is predicted as 'Unaffected' as it does not contain any pest.



In above screen uploaded image is classifier as 'Aphids

7. CONCLUSION AND FUTURE WORK

Techniques for image processing are crucial in the detection of pests. Finding whiteflies, aphids, and thrips on greenhouse crops is our first goal. We provide a cutting-edge method for pest early detection. We employ a pan, tilt, and zoom camera to find items. So, we are able to snap the picture without upsetting the bugs. It serves as an example of how complementing disciplines and methodologies could be combined to create a strong, automated system. The prototype technique worked well for quickly identifying pests. It has a similar performance level to a traditional manual approach

and is rather easy to use. Early insect detection is important for reducing the need for pesticides.

7. REFRENCES

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