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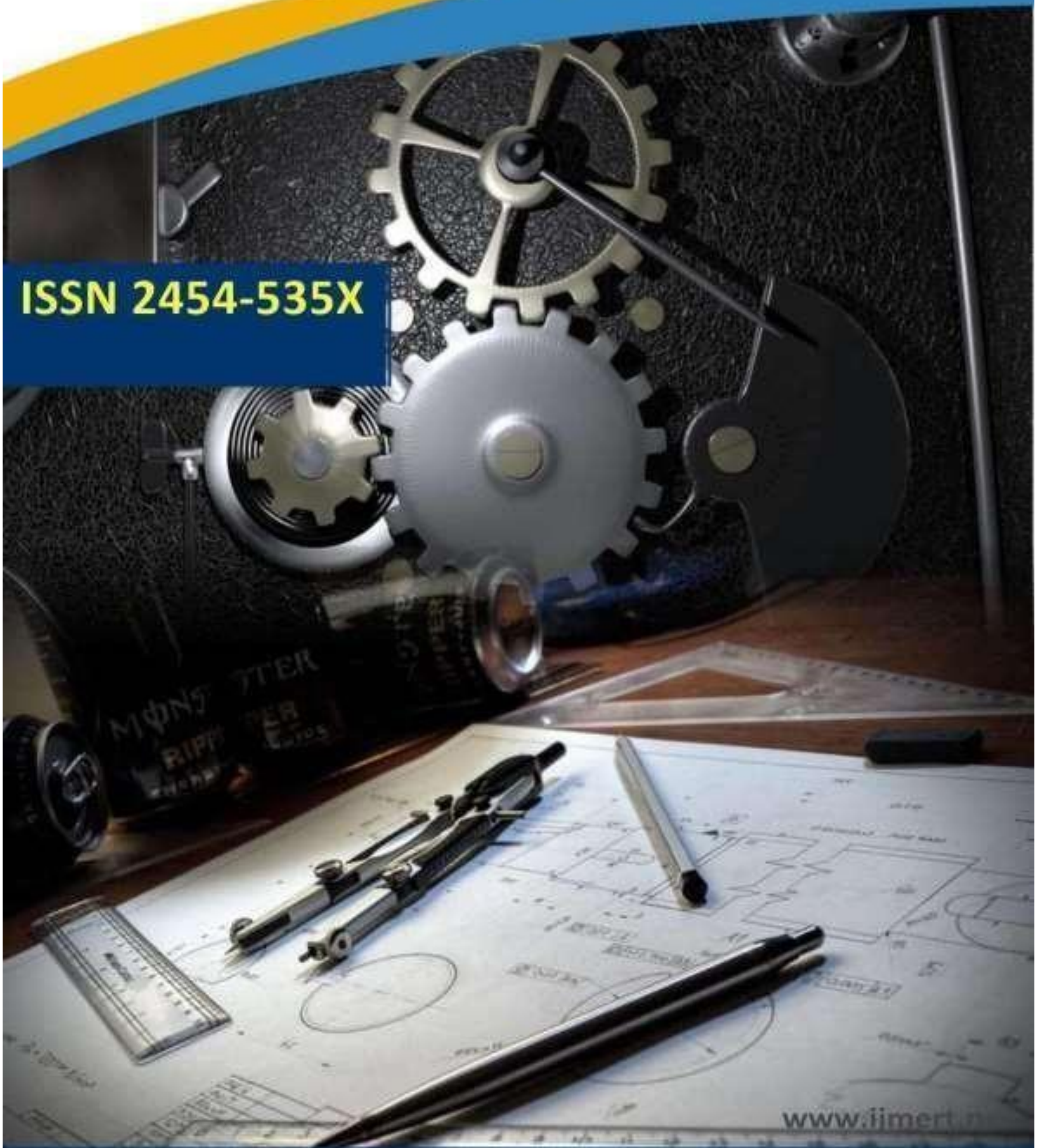

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EARLY PEST DETECTION FROM CROP USING IMAGE PROCESSING AND COMPUTATIONAL INTELLIGENCE

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ABSTRACT:

In the agricultural sector, one of the significant challenges revolves around promptly identifying and addressing pest infestations. While insecticides offer a convenient solution, excessive use poses risks to both human health and the ecosystem. Integrated pest management aims to prevent parasite infections through a combination of physical and biological methods. Within agricultural research, digital image processing plays a crucial role, especially in ensuring plant security and productivity. This study explores a new approach for early parasite detection, utilizing digital video cameras to capture images of affected leaves. Through attribute extraction and picture classification algorithms, insect presence on leaves is detected and refined to grayscale images. These images are then processed using MATLAB software, employing feature extraction techniques. Support Vector Machine classifiers are utilized to identify the types of pests present, aiding in targeted pest control strategies.

Keywords: MATLAB, RGB, crop, image processing, pest, SVM, AI.

I.INTRODUCTION

Farming is the main economic activity in India. Typically, farming is the main source of income for 70% of the population [1]. Therefore, increasing plant efficiency is a pressing issue right now. Investigations in this field are being conducted by the majority of researchers. This becomes a piece of cake when you use their cutting-edge

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methods and put them into practice. However, "bug infection" on plants is today one of the most important issues. Greenhouse plants are the main subject of this article [2]. A variety of plants are grown in greenhouses. For instance, fruits and vegetables such as cucumbers, tomatoes, potatoes, and so on, as well as flowering plants like roses and jasmine. The three most prevalent types of insects that may harm these verdant houseplants are trips, aphids, and white-flies [3]. The use of pesticides is one strategy for controlling the insect infestation. Certain types of insects may be controlled with the use of pesticides. Chemicals have a negative impact on ecosystems and the environment [4].

Air, water, and soil will undoubtedly be polluted by the excessive use of chemicals. Pesticide suspensions are carried by the wind and end up contaminating other places. Our primary emphasis in this study is on finding bugs early on. This necessitates keeping an eye on the plants from time to time [5]. The usage of cameras allows for the acquisition of photos. Next, photo processing procedures must be used to the obtained picture in order to analyse the picture materials [6]. Picture interpretation for insect identification is the main focus of this article.

Farming is the main industry in India. The agricultural sector typically provides income for 70% of the population. Therefore, increasing plant efficiency is a key focus. This area is receiving a lot of attention from researchers. This is a breeze when you use their cutting-edge methods and practical tools [7]. The problem of "pest infection" on plants is one of the most important ones right now. The focus of this article is mostly on crops grown in greenhouses. In greenhouses, many different kinds of crops are grown. vegetables (cucumber, potato, tomato, etc.) and flowers (rose, jasmine, etc.) are examples. Whiteflies, aphids, and thrips are among the most common pests that may harm these verdant houseplants. Using pesticides is one way to control the bug infestation [8]. Some pests can be controlled with the use of pesticides. Toxic pesticides degrade ecosystems and harm the air we breathe. When chemicals are used excessively, they

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contaminate the air, water, and soil. Dispersions of pesticides contaminate different areas when carried by the wind. The focus of this study is the first identification of insects [9]. This indicates the need for regular plant monitoring. By use of cameras, images are captured [10]. The next step is to apply image processing techniques to the acquired picture in order to analyse the photo materials. Picture analysis for pest finding is the main focus of this article [11].

II.LITERATURE SURVEY

Here, we'll take a look at the pros and cons of some of the current techniques used to spot parasites in greenhouse plants early on. Below, we have outlined the strategies along with their benefits and drawbacks.

Finding Insects with the Use of Video Analysis

Photo processing techniques and a knowledge-based approach are both included in this role. [1] Whiteflies are the only insects it can detect. When compared to the results obtained by manual methods, this system's accuracy and reliability are far higher. In reality, it is an interdisciplinary cognitive vision system that uses a wide variety of methods, including computer vision, AI, image processing, and more. For this task, they used white flies as the screening parasite and rose plants as the screening crop. It was not easy to get detected. As a result, they collected adult flies. Nevertheless, there were also some problems with the detection of adulthood. At any point throughout the picture-taking process, the adult may take flight. Therefore, they decided to scan the rose leaves while the flies weren't active. Finding white flies at the start of the project is the future goal.

Method that employs Delicate Snares

Using video clip analysis, the goal of insect detection via camera network [2] is to identify parasite infections on plants. Finding and counting the insects using the conventional methods would undoubtedly take much more time. This is why they came up with an automated technique that uses video assessment. Five wireless electronic cameras were used in the greenhouse. As a crop to test, they chose climbing. This task requires

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the usage of sticky traps. All it takes to set up a sticky trap is a sticky substance with coloured dots to entice bugs. Their method for pest identification included using video division algorithms in conjunction with finding and adaption strategies. No matter the weather, the adaptive system will work. The long-term goal of this technology is the early detection of novel insect species.

III.PROBLEM STATEMENT

It is common practice to use computer vision, artificial intelligence, or deep understanding breakthroughs to identify plant conditions; however, it is uncommon to compare many methods for the same task; instead, just one way is often used. The majority of automated bug detection and identification services only consider a single technology solution, rather than exploring all of the possible options. Recent years have seen tremendous progress in computer vision and object identification. Item classification and object identification are only two examples of the many visualization-related computer vision issues that use ILSVRC the ImageNet public dataset as their standard. Canine, Salient Regions, SURF, SIFT, MSER, and other feature detection algorithms used to be the gold standard for picture categorization problems. With these features, several finding methods are used for function extraction.

IV.METHODOLOGY

Upload Pest Dataset:

This module is used to upload datasets to the application.

Then, we'll pre-process the datasets by acquiring images from the dataset, filtering them to greyscale, normalising them, and finally, splitting the dataset into a train and test part. About 80% of the images will be used for training, and 20% will be used for testing.

To run the SVM algorithm, we will feed the processed photos into it as training data, and then we will determine how accurate its predictions are.

This module allows us to input a test picture and use support vector machines to forecast if the image contains aphids, white fly larvae, or is unaffected.

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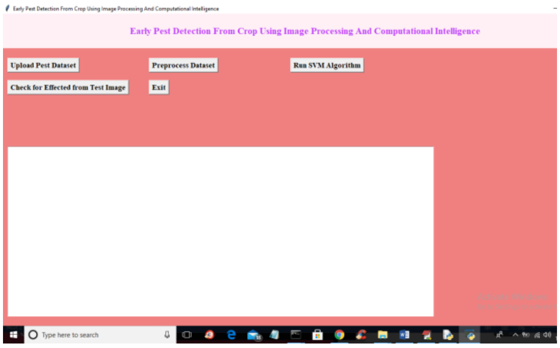
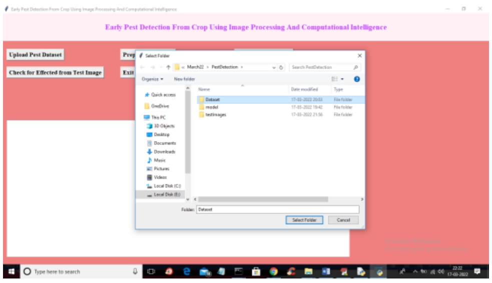
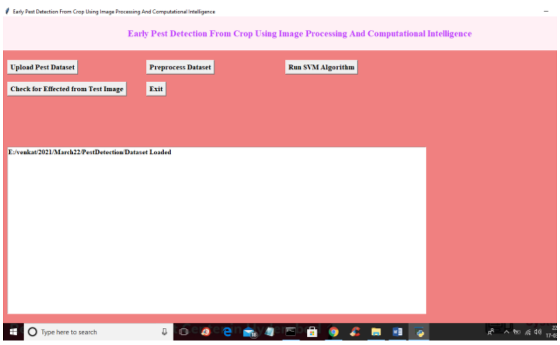


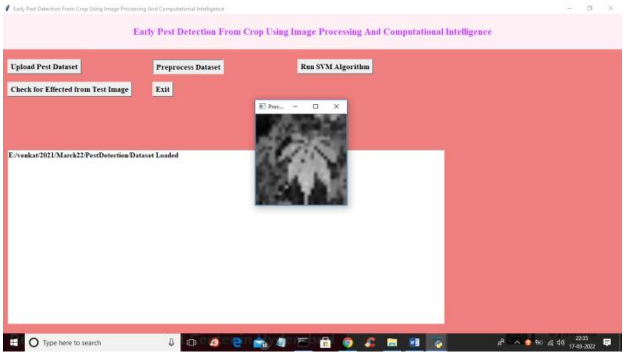
To upload a dataset, go to the first screen and look for the "Upload Pest Dataset" button.



To load the dataset, go to the first screen and choose the "Dataset" folder. Then, click the "Select Folder" button. This will bring you to the second screen.



To read and normalise the pictures in the loaded dataset, split it into a train and test set, and then click the "Preprocess Dataset" button on the top screen.



The upper screen is showing a processed grey picture; to see the screen below, dismiss the image.

Click the "Run SVM Formula" button to train SVM with improved photographs and then calculate its prediction accuracy. On the above screen, you can observe a range of images and courses found in the dataset.

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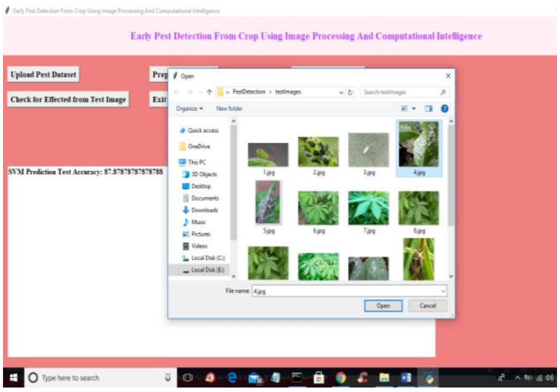
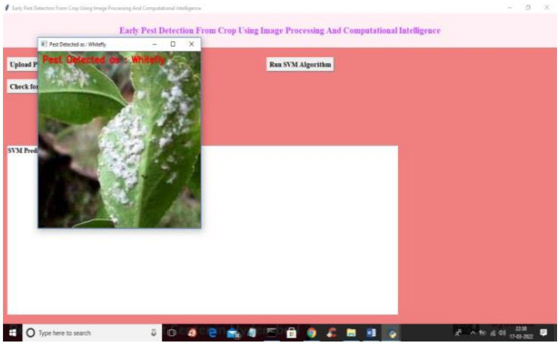
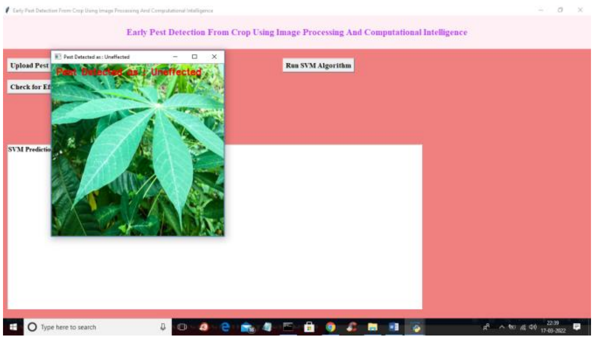
After you've achieved 87% prediction accuracy using SVM, as demonstrated on the previous page, click the "Check for Effected from Test Image" button to submit a test image that looks like the one below.



Click the "Open" button after choosing and uploading the 4.jpg file on the previous screen to get the following result.



You may submit and test more photographs in the same way; in the following panel, the red text indicates that SVM predicted or classed the uploaded image as "whitefly."



The uploaded picture is expected to be labelled as "Uneffected" on the above screen since it does not contain any pests.

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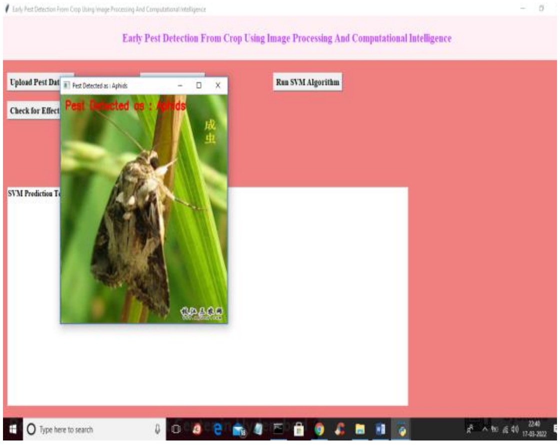
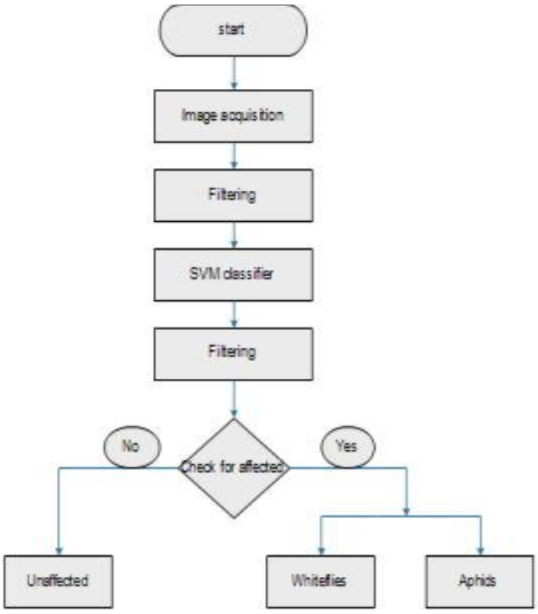


In the above screen, uploaded image is classifier as 'Aphids'

V. FLOWCHART

Figure 3 shows a flow diagram of the proposed system. A camera is used to capture the pictures, which are then filtered using bicubic filters to remove any unwanted noise. Actually, here is where the images are pre-processed. In order to identify the pest infection, svm classification is the next stage. Once again, it is applied to the svm in order to determine the kind of pest if the picture is impacted.



VI. CONCLUSION

The field of pest detection has invested in image processing systems. Our main goal is to detect pests like trips, aphids, and white flies on greenhouse crops. We provide a fresh method for identifying pests at an early stage. Using a pan-tilt-zoom camera allows us to see finer details. So long as we do this, we can get the shot without disturbing the bugs. It exemplifies how teams of different backgrounds worked together to create a system that is both automated and very adaptable. Rapid pest identification was made possible by the prototype technology, just as promised. On top of being easy to use, it

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performs about the same as a regular manual method. We want to decrease pesticide use by detecting pests early on.

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