Pest Detection And ReductionUsing Image Processing And Automation

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Abstract. A poll indicates that 70% of Indians depend on the agricultural industry. Food shortages can be greatly reduced and wholesome, nutritious food can be supplied through the agriculture sector. Because pest infestations significantly harm crops and degrade their quality, farmers have a tough time recognizing crop insects. The drawback of traditional insect identification is that accurate identification of insects based on morphological traits requires taxonomists with specialized knowledge. New advancements have been made in the search for pests in crop fields. This study focuses on the use of image processing to recognize pests and automation to select the best insecticide to get rid of them. The curated image contains the name of the recognized insect, which is input into automation[2]. This results in the eco-friendly organic insecticide. Using this will aid the grower who is less knowledgeable about bugs and insecticides.

Keywords—image processing, Automation, Pest detection, computer vision.

I. INTRODUCTION

The country's economic growth and living standards are influenced by agriculture, which is regarded as the foundation of the economy. One of a nation's main economic sectors, agriculture, food processing business is crucial to raising the standard of agricultural and food exports. The effect of transportation revenues and local market demands on the growth of food processing transformations in emerging nations is the key cause. Under certain circumstances, it necessitates a lot of workspaces, equipment upkeep, and storage. One of the major issues facing the agricultural industry that lowers crop quality is pest attack. Crops are severely damaged by pests, disease, and weeds, which leads to a small market for the finished goods. Discovering new strategiesto achieve even modest gains in productivity can mean the difference between their earning a profit or a loss.

The insect effect on crops that hinders development of crops must be dealt with. The large amounts of production are mostly contributed by the extremely important cash crops. Insects are the primary cause of agricultural quality decline and consequently lower crop productivity. So, it is essential to track and assess insect-related losses in order to assure crop quality and safety in agriculture.

Due to insect assaults, India loses a crop output of about 18% annually, which is equivalent to a loss of about 90 billion rupees. Pests that can be seen and recognised with the naked eye and call for constant attention. On big agricultural fields, this method, however, becomes impracticable. This approach is also exceedingly time-consuming, expensive, and inaccurate. Owing to these drawbacks, the integrated pest management (IPM) strategy, a method for controlling pests with minimal negative effects on the environment, has evolved. IPM consists of three crucial steps: detection, identification, and application. It uses machine vision to inspect plants while also looking for pests. It has served as the foundation for image analysis for a number of crop applications, including the identification of the affected area, the determination of the affected area's colour, the detection of pests at stem/leaf parts, etc. Both precise guidance and pest detection methods, such as automatic detection through image processing techniques, are required for pest management. Many different works explain the various methods for object identification, feature extraction, and pest identification in accordance with various parameters like pixels intensity, foreground colour, background colour, which ranges boundary, overall colour, etc.

In the research, we will show how to use automated pest recommendations to reduce pest populations and to detect pests using image processing techniques. When combined with Wavelet Transformation, Oriented Rotated Brief is utilised for this. Part II of the article, which includes a literature review, is arranged as following.

Part III talks about the proposed methodology. The conclusion is wrapped up in section IV.

II. LITERATURE

In the present era, many young engineers are blooming with ideas to solve real time problem. One such problem is pest control.

Leng A. G. K. and et.al[1] developed PyBot. Due to the dynamic Web's rapid growth, users must spend a significant amount of time just retrieving a small portion of its data. People's lives have been made easier by the development of search engines because they can access the resources they require more quickly. Web crawlers are an algorithm that search engine spiders use to collect information from the World Wide Web.

According to S.K. Malik and colleagues' definition [2], web scraping is a technique for extracting pertinent information from HTML pages. Prologue Server Pages (PSP), a scripting language based on the Prologue language, could be used to achieve it. Finally, using semantic annotation is a technique that enables giving unstructured textual materials both a formal structure and semantic content. Semantic data extraction can be carried out using the Knowledge Information Management, or KIM, tool, which can finish this crucial task. We review, analyse, and discuss various online information extraction techniques, such as web use mining, web scraping, and semantics annotation, in order to improve and increase the efficacy of information extraction from the web.

According to P. Rajan and colleagues [3,] early pest and disease detection will reduce production losses. Unaided observation is a useful technique for identifying the pest. However, the procedure takes a long time. In this paper, we present a system for automatic pest identification based on image processing. Utilising the colour feature, the SVM is trained to differentiate between pest and leaf pixels. Morphological operations are used to attempt to eliminate the undesirable components of the classified image.

According to M. N. Jige and colleagues, et al.,[4] pest identification is the key step in a successful crop. To stop the spread of pests and determine the ideal dosage of insecticides, it is helpful to count whiteflies on leaves. This article describes an approach for MATLAB's image processing-based automated whitefly detection and counting.

Early identification of pests in photographs in particularly important for successful of pest control management, according to A. Sriwastwa and colleagues[5]. Hence, it has been difficult to identify the pest in the picture. In this study, we employ a color-based picture segmentation technique to accurately find the pest. The thorough simulation results on several pest photos demonstrate that the suggested technique works better than the current Otsu's method and edge detection segmentation.

V. Singrodia and et.al[6] concentrate on several elements of online scraping, starting with a basic introduction and a quick examination of the different applications and tools available. The method of web scraping was also described, along with a discussion of the various web scraping approaches. Finally, we came to a conclusion by outlining the advantages and disadvantages of web scraping, as well as the numerous industries in which it may be used. These data present a wide range of opportunities, including those related to Big Data, Business Intelligence, aggregators and comparators, the creation of new applications, and mashups between other fields.

Ridwang, A. A. Ilham and et.al[7] achieved for ordinary picture data with a search image limit of up to 20 photos exceed 90% accuracy. There is a cap of 20 photographs, and the accuracy for certain images is just 25%. A very big picture limit and a highly precise query or image name both reduce the amount of relevant images that search engines produce, which has an impact on the accuracy value of image searches. It is anticipated that using this image search strategy, it will be possible to identify and download photos that are both highly relevant and of good quality, which can then be utilised as training data for the image classification process.

In order to learn more about the efficacy of Google's image search algorithm and to inform users and researchers, Y. Bitirim and colleagues[8] examined the mean Average Precisions (APs) across various threshold values for locating comparable images using fresh Illustration Calls (IQs) from each of the five groups "Fashion," "Computer," "Home," "Sports," and "Toys."

The objective of the study, carried out by H. Nagar and R. S. Sharma[9], is to improve the extraction of features phase in order to boost the effectiveness of the detection. The suggested technique is put into practise using photographs of fluffy caterpillar pests on mustard and fava bean crops which were collected from a farm in Rajasthan. The experimental findings support the effectiveness of the proposed tactics.

Two approaches have been developed for detecting the pest, as reported by T. Keerthi and colleagues [10]. One approach uses the thresholding and edge detection through image processing techniques in order to determine the presence of the pest. It provides the pixel range so that the image can be clearly identified. In our work, we took into account a typical value of one hundred pixels. The general shape of the pest can be identified using the edge detection method. The other approach uses convolution deep neural networks (CNN), which first execute direct wavelet transforms (DWT), subsequently move on to neural network detection, and finally area detection to detect pests. These techniques help in the advancement of pest detection.

III. PROPOSED SYSTEM

Creating a framework for spotting fluffy caterpillars on cropped photos is the goal of this study. For this, the ideas of soft computation and processing images are used. The five main steps of the research— database collecting, database normalisation, Training, evaluation, and verification of feature extraction —can be separated into five groups, as illustrated in Fig. 1.

The sections that follow include descriptions of the stages as shown in Fig.1.

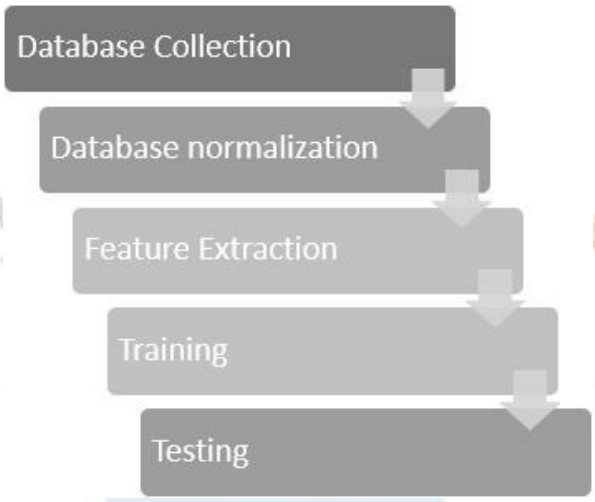


FIGURE 1 Five Major Phases

A. Database Collection

Indian farms provided the dataset that was used in this investigation as shown in Fig. 2 The dataset that was gathered already included pests on the crop. The background colour and bugs on the leaves change in the photographs that make up the followed dataset, which were captured from various angles.

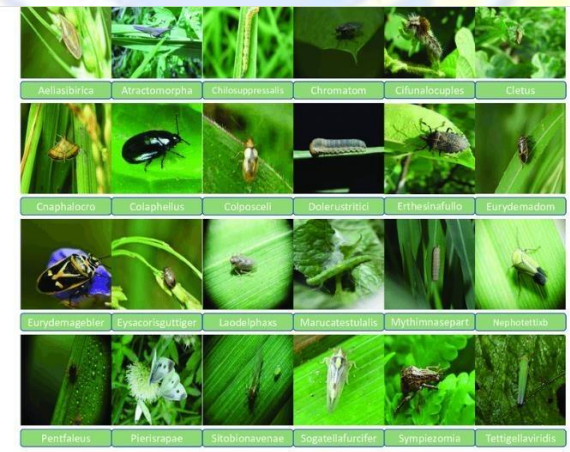


FIGURE 2 Images In Insect Data Set

Tables

TABLE 1: Number of insects in dataset

Insect class	No of insects
Aeliasivirica	77
Atractomortha	64
Thilosuptressalis	35
Chromatom	52
Cifunalocutles	20
Cletus	96
Sitobionavenae	83
Pentfaleus	5
Tettigellaviridis	17

B. Data Normalization

Images from the gathered dataset was filtered. based on quality. Images with poor resolution were deleted.Before further processing, the cleaned photos were scaled down to 256*256 dimensions. At random, the consequent visuals were divided into eight groups of two each. In this case, 80% of the photos were used to train the model, as well as the other twenty percent were saved for testing. The table above presents the identified pests in addition to the number of them.

C. Feature Extraction

The image that was entered is processed in this step to extract important characteristics that will later be used in the stages of training and testing.

The three key subroutines used in this stage are Obtaining Area of Interest (ROI), Gathering Complete Image, Extracting ORB key elements, and Extracting feature descriptor.

- *Extracting Region ofInterest*

The Wavelet transformation algorithm for image navigating renders this feasible. The image has been split into four subbands by using the forward discrete wavelet transformation (FDWT): one low frequency subband (LL) and three high frequency subbands (HL, LH, and HH).

- *Extracting ORB key points*

The ORB method is then applied to the detailed image. The ORB algorithm has two parts: FAST and BRIEF Fast (Features from Increased and Parts Test). The strongest ORB key points were used to create the feature descriptor.

This step must be implemented for an instant but successful feature comparison.. The feature points are extracted and shown as in Fig. 3.

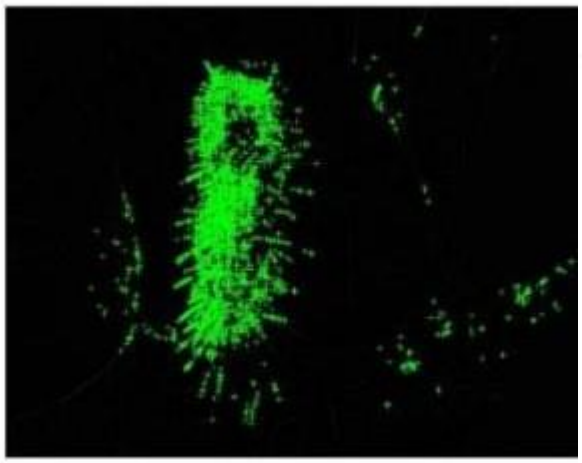


FIGURE 3 ORB Feature Points

D. Insect Identification

The insect-borne disease detection algorithm emphasises finding insects with complex backgrounds by applying segmentation and then locating the useful contour in the insect image. This algorithm is applied to datasets of insects.

The instance insect detection representations appear in Fig. 4

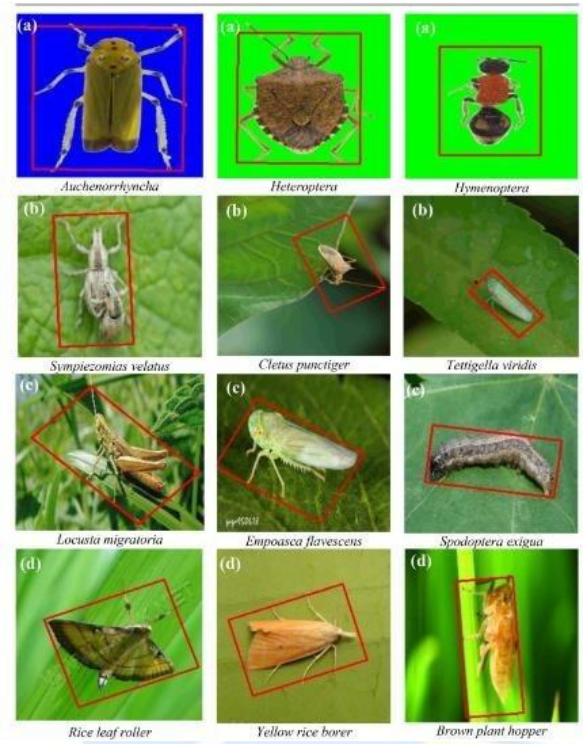
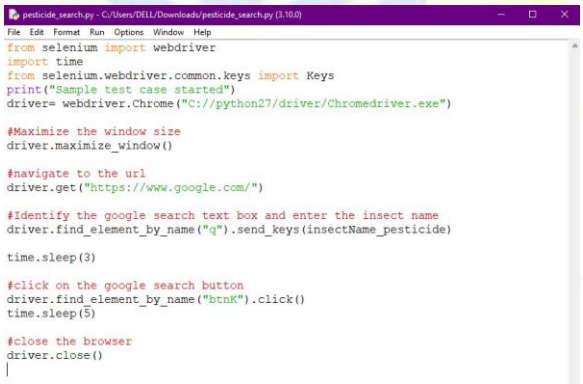


FIGURE 4 Sample Of Insect Detection Results

E. Feed to search Engine

A python script is used to automate the searching of insect name to find its appropriate pesticide in a search engine as shown in Fig. 5.



pesticide_search.py - C:/Users/DELL/Downloads/pesticide_search.py (3.10.0)

File Edit Format Run Options Window Help

```
from selenium import webdriver
import time
from selenium.webdriver.common.keys import Keys
print("Sample test case started")
driver= webdriver.Chrome("C://python27/driver/Chromedriver.exe")

#Maximize the window size
driver.maximize_window()

#navigate to the url
driver.get("https://www.google.com/")

#Identify the google search text box and enter the insect name
driver.find_element_by_name("q").send_keys(insectName_pesticide)

time.sleep(3)

#click on the google search button
driver.find_element_by_name("btnK").click()
time.sleep(5)

#close the browser
driver.close()
```

FIGURE 5 Script For automating search in google

F. Web scrapping for searching best pesticides

Data scraping, also known as web scraping, is the process of extracting information from web pages and importing it into written documents or Excel spreadsheets. Web data is gathered and used by other websites or by the person doing the scraping for their own purposes

- *HTML Parsing*

JavaScript is employed for targeting an ordered or embedded HTML page throughout HTML parsing. It is an effective and quick technique for collecting text and links (like an email address or nested link), scraping screens, and obtaining resources.

The insect name is fed to the search engine using python script. Using web scraping techniques like parsing, search result is retrieved. The result is alerted to the farmer.

In the previous referred paper [1], image dataset has been collected only from farms of Rajasthan. Insect identification is done with Oriented FAST and rotated BRIEF (ORB) alongside Wavelet Transform. In [2], the insect has been identified and pesticide has been sprayed on specific place where the insect is present using Edge Detection technology. Paper [3] provides further information in separating background from foreground where the image is present. [6] gives information about web crawling and web scrapping technologies. In the proposed system, as represented by the block diagram (Fig. 3), pests are identified based on their feature points. The identified pest name is fed into the search engine and a useful pesticide is suggested to the farmer by automating a search scriptin python and returning the pesticide nameby web scrapping algorithms.

IV. CONCLUSION

In this study, a method for automated pest identification is described that makes use of wavelet transformation, Oriented FAST and rotated BRIEF (ORB), automation, and web scraper and Python. Images of pests on crop fields are used to exemplify the suggested technique. With the use of wavelet modification and image fusion, the Region of Interest is extracted. In terms of computing time and storage costs, ORB is rapid and affordable when compared to other key point detectors like SIFT and SURF. A search engine is used when the insect's name has been entered. By using scripts, Web scrapers, and HTML parsing tools, the search is automated. By including pictures of various pests, the study work that is now being presented can be further expanded. Extensive research can be made on the effects made by the pests on crops. To generate a real-time pest reduction system, the suggested strategy can be paired with wireless sensor networks or the Internet of Things.

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