PEST CONTROL USING MACHINE LEARNING AND IMAGE PROCESSING

VIJAYA LAKSHMI B
UG Student, CSE Dept, Sri Sairam College of Engineering, Bengaluru.

SAI HARIKA B
UG Student, CSE Dept, Sri Sairam College of Engineering, Bengaluru.

PRIYANKA S
UG Student, CSE Dept, Sri Sairam College of Engineering, Bengaluru.

SUMOL S
UG Student, CSE Dept, Sri Sairam College of Engineering, Bengaluru.

ARPITHA VASUDEV
Assistant Professor CSE Dept, Sri Sairam College of Engineering, Bengaluru

Abstract: Agriculture not solely provides food for the human however it is additionally a giant supply for the economy of any country. Insects and pests harm the crops and, thus, square measure terribly dangerous for the general growth of the crop. Early tormentor detection may be a major challenge in agriculture field. The best means, to manage the tormentor infection is that the use of pesticides. However, the excessive use of pesticides square measure harmful to plants, animals still as masses associate degree automatic approach for early tormentor detection. The techniques of digital image process square measure extensively applied to agricultural science and it have nice perspective particularly within the plant protection field, that ultimately ends up in crops management. This paper deals with a new variety of early detection of pests' system. pictures of the leaves plagued by pests' square measure nonheritable by employing a photographic camera. associate degree automatic system is needed which may not solely examine the crops to notice tormentor infestation however can also classify the sort of pests on crops. YOLO algorithmic rule is employed for tormentor detection and Support Vector Machine (SVM) is employed for classification of pictures with and while not pests supported the image options.

Index terms: YOLO and SVM Algorithm, Pest Detection, Plant protection, Machine Learning

I. INTRODUCTION

India is an agricultural country. Agriculture plays a crucial role within the international economy. Pressure on the agricultural system can increase with the continued growth of the human population.

seventy percent of the population chiefly depends upon agriculture. Thus, increasing the productivity of crops is a very important matter currently. Most of the scientists do their researches on this field. Agri-technology and exactitude farming, currently additionally termed digital agriculture, have arisen as new scientific fields that use information intense approaches to drive agricultural productivity whereas minimizing its environmental impact. By mistreatment their new techniques and sensible implementations this can be terribly simple. However, one in every of the foremost necessary drawback currently exists is „pest infection" on plants. The excessive use of pesticides can grime air, water, and soil. Carried by the wind pesticides suspensions contaminate alternative areas. during this paper, we tend to specialize in early tormenter detection. this means to regular observation the plants. pictures square measure nonheritable mistreatment cameras. Then the nonheritable image should be processed to interpret the image contents by image process ways. the main target of this paper is on the interpretation of image for tormenter detection. Pesticides can suppress explicit species of pests. Pesticides square measure damaging for the setting and turn out significant harm to eco systems.

II. LITERATURE SURVEY

A. Pest Detection and Extraction Using Image Processing Techniques

Detection of pests within the paddy fields may be a major challenge within the field of agriculture, so effective measures ought to be developed to fight the infestation whereas minimizing the employment of pesticides. The techniques of image analysis are extensively applied to agricultural science, and it provides most protection to crops, which might ultimately lead to higher crop management and production. observance of pests infestation depends on men, but automatic monitoring has been advancing so as to attenuate human efforts and errors. This study extends the implementation of different image process techniques to find and extract insect pests by establishing an automatic detection and extraction system for estimating blighter densities in paddy fields. Experiment results shows that the planned system provides a simple, efficient and fast solution in detecting pests in the rice fields.

B. Machine Learning in Agriculture: A Review

Typically, ML methodologies involves a learning method with the target to be told from "experience" (training data) to perform a task. knowledge in milliliter consists of a collection of examples. Usually, a personal example is delineating by a collection of attributes, conjointly called options or variables. A feature is often nominal (enumeration), binary (i.e., 0 or 1), ordinal (e.g., A+ or B−), or numeric (integer, real Sensors 2018, 18, 2674 four of twenty-nine variety, etc.). The performance of the milliliter model during a specific task is measured by a performance metric that's improved with expertise over time. To calculate the performance of milliliter models and algorithms, numerous applied mathematics and mathematical models square measure used. when the tipoff the training method, the trained model is often accustomed classify, predict, or cluster new examples

(testing data) victimization the expertise obtained throughout the coaching method. Figure one shows a typical milliliter approach. Sensors 2018, 18, x FOR referee four of thirty-one metric that's improved with expertise over time. To calculate the performance of milliliter models and algorithms, numerous applied mathematics and mathematical models square measure used. when the tip of the training method, the trained model is often accustomed classify, predict, or cluster new examples.

C. Automated Crop Inspection and Pest Control Using Image Processing

There square measure many machine-controlled systems obtainable in literature, that square measure developed for irrigation management and environmental observance within the field. However, it's essential to observe the plant growth stage by stage and take choices consequently. Additionally to observance the environmental parameters like hydrogen ion concentration, moisture

content and temperature, it's inevitable to spot the onset of plant diseases too. it's the key to forestall the losses in yield and amount of agricultural product. disease identification by continuous visual observance is very troublesome task to farmers and at identical time it's less correct and may be worn out restricted areas. Hence this comes aims at developing a picture process algorithmic rule to spot the diseases in rice plant. Rice blast disease occurring in rice plant is because of magnaporthe grisea and this sickness conjointly happens in wheat, rye, barley, pearl and millet. because of rice blast sickness, sixty million individuals square measure affected in eighty-five countries worldwide. Image processing technique is adopted because it is a lot of correct. Early sickness detection will increase the crop production by inducement correct chemical usage.

III. PROPOSED METHOD

For this study, detection was administered within the paddy fields as a result of rice is that the most vital and a primary supply of food in Bharat. but rice might lose its amount and quality once rice is attacked by different insect pests. Therefore, it's a high priority to seek out effective strategies to scale back the extent of their infestation within the paddy fields. Samples are collected by mistreatment the pan tilt camera with rivet paddy fields. The nonheritable pictures are given to the native machine and the image process techniques can take place.

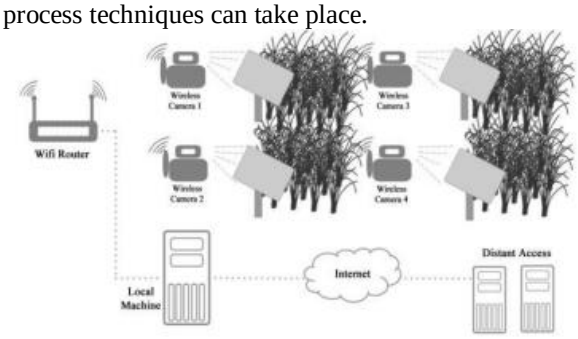


Fig 1: Proposed System Architecture

A. Methodology

1) Image Acquisition

The first step of each image process application is image acquisition or image capturing. The images of leaves square measure captured by mistreatment the camera and it'll store it in some formats like .PNG, .JPG, .JPEG etc. The setup of a network of wireless cameras in conjunction with the sticky traps to capture the insect pests. The cameras used square measure CISCO Linksys Wireless-G net Home observance Camera which might capture ten frames per seconds at eight-megapixel resolution. The captured pictures were processed employing a native machine equipped with Processor.

2) Image pre-processing

Image pre-processing creates an enhanced image that is more useful in processing the still image. The image preprocessing steps used in the system are: 1) Conversion of RGB image to gray image 2) Resizing of the image 3) Filtering of the image.

a) Conversion of RGB to Gray Image in RGB color model, each color appears in its primary spectral components of red, green, and blue. The color of a pixel is made up of three components; red, green, and blue (RGB). The disadvantages of RGB models are, it requires large space to store and it will take more time to process. So, there is a need for converting the RGB model to Gray model. In this study, grayscale image is enough for the method so RGB image is converted into grayscale image with the following formula: $I(x, y) = 0.2989\times R + 0.5870\times G + 0.1140\times B$

b) b) Resizing of the Image Resizing is an important step in image preprocessing. Resizing, changes the dimensions of an image. The captured image is resized according to the requirement of the system. There are different methods for the resizing of images. Bilinear, Bicubic and Nearest neighborhood interpolation are the common resizing methods.

c) Filtering of the image Filtering is nothing but, eliminating the unwanted portion of the image. In our system we are using smoothening filter. The purpose of smoothing is to reduce noise and improve the visual quality of the image. Spatial filters are applied to both static and dynamic images, whereas temporal images are applied only to dynamic images. The simplest smoothening filter is average filter. It consists of a 3X3 matrix of 1 and it is divided by 9.

3) Feature Extraction

Feature extraction is that the most vital a part of this project. Some properties of the pictures area unit considered here. the various sorts of properties include region properties, grey variance matrix properties etc. The properties variance, entropy, distinction etc. area unit extracted from the image and area unit to train the dataset for the SVM classification. Support Vector Machines (SVM's) area unit a relatively new learning technique used for binary classification. The essential plan is to search out a hyper plane which separates the

d-dimensional information absolutely into its 2 categories. the various sorts of properties of a picture is listed within the table below.

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

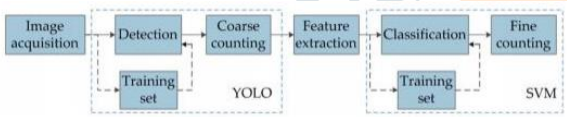
4) Detection and Classification

In this module the affected and unaffected images are compared by using the dataset provide in the SVM. If it is an affected image again it is compared by using the second dataset provided in the SVM. From this comparison the type of pest can be detected.

5) Determining the amount of pesticides to be used

Based on the count of pests detected and classified, the amount and type of the pesticides are determined. The determined amount of pesticides is sprayed through sprinklers.

IV. FLOW CHART



V. DETECTION

The purpose of this module is to detect insects. Since image acquisition process is easily affected by illumination, camera out of focus, impurities and other factors, the detection algorithm needs to have strong anti-interference ability and reliability. Although deep learning method such as YOLO can usually obtain good performance, it is difficult to get enough samples of some specific insects. Therefore, we propose the resolution of regarding all species of insects as one class, using deep learning method to detect and coarsely count insects, and providing detecting results to SVM to make fine classification. In this way, the problem of insufficient samples is solved. Besides, the system is easy to add or change identified categories of flying insects without re-training the whole system.

Training set:

In this study, the insects are manually labeled using rectangle as the dataset for YOLO. And images are collected as the training set for SVM. Both positive samples and negative samples are included in the dataset. And the samples are validated by multiple experts.

Coarse counting:

In this process, the number of flying insects can be obtained, but the specific species of insect is not provided.

Feature extraction:

Feature extraction is concerned with mathematical tools for quantitatively describing an object. To obtain overall feature information, multiple features are chosen in this work to establish the feature space.

Classification

Based on the extracted features, we use SVM to classify the detection results of YOLO into 7 classes including bees, flies, mosquitoes, moths, chafers, and other insects.

Fine counting

To quantitatively describe the intensity of different species of flying insects and to accurately monitor their population dynamics, it is necessary to obtain the number of every species of insects.

VI. CONCLUSION

Machine learning will simply consume unlimited amounts of knowledge with timely analysis and assessment. It tends to work at accelerated levels. The image recognition app identifies doable defects through pictures captured by the camera. Users are then supplied with soil restoration techniques, tips and alternative doable solutions. YOLO, a unified model for object detection. Our model is easy to construct and might be trained directly on full pictures. in contrast to classifier-based approaches, YOLO is trained on a loss perform that directly corresponds to detection performance and therefore the entire model is trained together. quick YOLO is that the quickest general object detector within the literature and YOLO pushes the progressive in period object detection. YOLO additionally generalizes well to new domains creating it ideal for applications that deem quick, strong object detection. the most benefits of image process are Digital pictures are often processed by digital computers. vital options like edges are often extracted from pictures which may be employed in trade. pictures are often given additional sharpness and higher visual look. Minor errors are often corrected. Image sizes are often multiplied or minimized. pictures are often compressed and decompressed for quicker image transfer over the network. pictures are often mechanically sorted reckoning on the contents they need. SVM rule has essentially benefits in terms of quality. SVM is found to possess higher performance much in most cases.

VII. REFERENCES

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