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Overview of Image Processing Approach for Identification of Agricultural Pests

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***Abstract*--Plant pest identification and detection is vital for food security, quality of life and a stable agricultural economy. Enormous agricultural yield is lost every year, due to rapid infestation by pests and insects.In vidarbha(Maharashtra) region, mostly in kharif period crops like cotton, soyabean, pigeonpea are grown and in rabi chickpea crop grown. Most common pod borer (Helicoverpa armigera) pest attacks cotton, pigeonpea, chickpea,sunflower,tomato and other crops. according to survey, minumum 10% of crop yield to pigeon pea crop is lost due to pod borer (Helicoverpa armigera) pest attacks. Various methodologies were proposed earlier for identification and detection of agriculture pests. Mostly work is done for identification of whitefly pest on sticky traps in greenhouse environments and in real fields. We propose a desion support system which exposes a advance computing technology that has been developed to help the farmer to identify agricultural pests and take proper decision about preventive or control measure of it. Diagnosis of agricultural pests in the field is very critical and difficult.In our proposed work, we would be capturing images of pests from cotton, pigeonpea,chickpea crops .after that captured image would be preprocessed for enhancement. Then segmentation will be carried out with help of OTSU thresholding.using segmentation we would be segmenting out pest from forground. After segmentation, various features of pests including color and shape will be extracted. This extracted features will be stored in database with name of pest. With the help of SVM classifier, we would be finding out the type of pest and give preventive and control measures to user.**

***Keywords*—agricultural pests, OTSU thresolding, SVM classifier, desion support system, Helicoverpa armigera.**

I. INTRODUCTION

India is an agricultural country wherein most of the population depends on agriculture and agriculture is one of the major domains which decides economy of the nation. The quality & quantity of the agricultural production is affected by environmental parameters like rain, temperature & other weather parameters which are beyond control of human beings. Another major biological parameter which affects productivity of the crop is the pests, disease where human beings can have control to improve the productivity of crop[10]. The position of the any country in the world depends on its economy and the economy of most of the countries depends on agricultural production. In country like India the farmers have wide diversity to select their crop for cultivation to produce maximum yield depending on environment available. However there are certain issues with field crop like to identify deficiency of nutrition in plants, to identify various diseases, various pests which affect crops. Each issue has an importance. Among one is detection of pests so that proper action should be taken to control it leading to minimize loss. When any of such a condition occurs then farmers uses his experience or knowledge and also refers some guide books. If they aware about the pest ,then they can take correct action and control the situation but if farmers does not have correct knowledge, then misidentification of any pests can be possible and incorrect controls measure like non-affecting pesticides can be used leading to wasting of work and money and most importance it may lead to serious problem to crops. Otherwise they may approach to any agricultural experts who give them suggestion regarding detection of infected pests and the treatment of incidence of pest for their crop/plant in order to prevent and control crop and increase the crop productivity. Commonly they may face following situations like :

a) Sometimes they have to go long distances for approaching the expert

b) Even though they go such distances expert may not be available at that time

c) Sometimes, the expert whom a farmer contacts, may not be in a position to advise the farmer with the available information and knowledge.

To break or avoid this long procedure, some decision system need to be design so that easy approach can be use by farmers to solve the issue of detection of pests in agricultural [3].In the recent past, several approaches based on automation and image processing has come to light to address this issue. Conventionally Manual pest monitoring techniques, sticky traps, black light traps are being utilized for pest monitoring. Manual pest monitoring techniques are time consuming and subjective to the availability of a human expert to detect the same [1].

Fig 1. pod borer pest affecting chickpea crop.

mostly there are commonly four stages of pest in their life cycle as eggs, larvae, pupa and adult stage. Out of which eggs and pupa stage is inactive stage means it does not affect the crops but larva and adult are active stages of pests which affects crops mostly. Hence identifying this two stages is most important to prevent yield loss.

II. LITERATURE SURVEY

Earliear papers are describing to detect mainly pests like aphids, whiteflies, thrips, etc using various approaches suggesting the various implementation ways as illustrated and discussed below.[6] proposed an cognitive vision system that combines image processing, learning and knowledge-based techniques. They only detect mature stage of white fly and count the number of flies on single leaflet. They used 180 images as test dataset .among this images they tested 162 images and each image having 0 to 5 whitefly pest. They calculate false negative rate (FNR) and false positive rate (FPR) for test images with no whiteflies (class 1), at least one white fly (class 2) and for whole test set.[9] extend implementation of the image processing algorithms and techniques to detect pests in controlled environment like greenhouse. Three kinds of typical features including size, morphological feature (shape of boundary), and color components were considered and investigated to identify the three kinds of adult insects, whiteflies, aphids and thrips. [2] promote early pest detection in green houses based on video analysis. their goal was to define a decision support system which handles an video camera data. They implemented algorithms for detection of only two bioagressors name as white flies and aphids. The system was able to detect low infestation stages by detecting eggs of white flies thus analyzing behavior of white flies.[1] proposed pest detection system including four steps name as color conversion, segmentation, reduction in noise and counting whiteflies. A distinct algorithm name as relative difference in pixel intensities (RDI) was proposed for detecting pest named as white fly affecting various leaves. The algorithm not only works for greenhouse based crops but also agricultural based crops as well. The algorithm was tested over 100 images of white fly pest with an accuracy of 96%. [7] proposed a new method of pest detection and positioning based on binocular stereo to get the location information of pest, which was used for guiding the robot to spray the pesticides automatically.[15] introduced contextual parameter tuning for adaptive image segmentation, that allows to efficiently tune algorithm parameters with respect to variations in leaf color and contrast. [4] presents an automatic method for classification of the main agents that cause damages to soybean leaflets, i.e., beetles and caterpillars using SVM classifier.[14] proposed Back propagation neural network for recognition of leaves, diseases,pests.

III. PRPOSED METHOD

The overall proposed methodology consist of several steps such as acquiring of pests sample for database. Next is preprocessing and image segmentation. furthur, feature extraction algorithm based on color and shape is evaluated then color and shape features are stored in database . Using classifier we would be finding out type of pest present in image and give remedies to control it.The decision support system has various steps which are as follows.

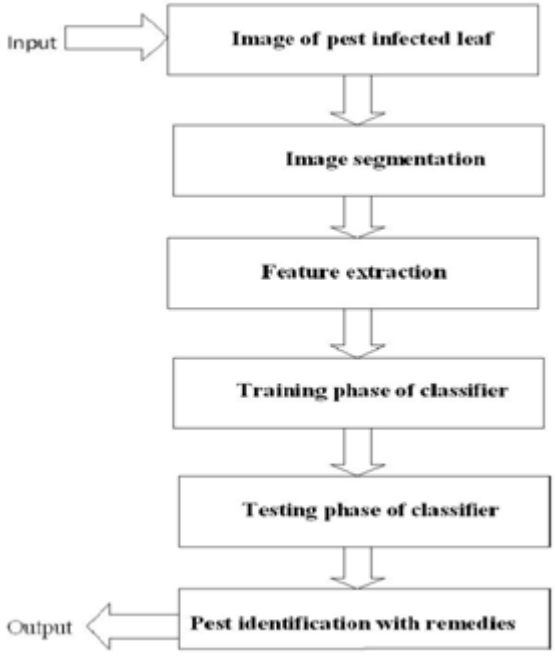

Fig.2: decision support system

1) Acquire Image and Preprocessing

Images of various pests like American bollworm and tobacco caterpillar on cotton, gram caterpillar and green pod

borer on pigeon pea, semilooper on chickpea are collected from various fields with the help of mobile camera or sony camera.The purpose of image preprocessing is to enhance the quality of the image and to highlight the region of interest. Image quality is susceptible to interference and noise during image acquiring [19]. Image enhancement is a mean as the improvement of an image appearance by increasing dominance of some features or by decreasing ambiguity between different regions of the image. Image enhancement processes consist of a collection of techniques that seek to improve the visual appearance of an image or to convert the image to a form better suited for analysis by a human or machine. Many images such as medical images, remote sensing images and even real life photographic pictures, suffer from poor contrast. Therefore it is necessary to enhance the contrast.The purpose of image enhancement methods is to increase image visibility and details. Enhanced image provide clear image to eyes or assist feature extraction processing in computer vision system.various image enhancement technique includes Histogram Equalization, Brightness Preserving Bi Histogram Equalization, Contrast limited Adaptive Histogram Equalization etc.[20].

2) Image Segmentation

Image segmentation in general is defined as a process of partitioning an image into homogenous groups such that each region is homogenous but the union of no two adjacent regions is homogenous [16].image segmentation is performed to separate the different regions with special significanc in the image . these regions do not intersect each other [21]. Using segmention , we would be segmenting out pest image which is in the forground.

3) Feature Extraction

The feature is defined as a function of one or more measurements, each of which specifies some quantifiable property of an object, and is computed such that it quantifies some significant characteristics of the object.In image processing , image features usually included color, shape and texture features. In propsed system, we would extract color and shape features. The color feature is one of the most widely used visual features in image processing. Color features have many advantages like robustness,effectiveness, Implementation simplicity, Computational simplicity, Low storage requirements. Color descriptors of images can be global or local and color descriptors represented by color histograms, color moments, color coherence vectors or color correlograms [12]. Shape features includes length, width , aspect ratio, rectangularity, area ratio of convexity, perimeter ratio of convexity, sphericity, circularity and form factor, etc

4) Database Creation

All extracted features would be added to database with their name of pests .

5) Database Evaualtion

With the help of SVM classifier, we would be identifying type of pest which is present in image and give preventive as well as control measure to it. Support Vector Machines are basically binary classification algorithms. Support Vector Machines (SVM) is a classification system derived from statistical learning theory [22]. The main idea of SVM is to find a decision surface (*H*) determined by certain points of the training set, termed support vectors between two point classes. This surface divides the training data (*xi*, *yi*) without mistake, that is, all points of the same class are divided in the same side while the minimum distance between either of the two classes and this surface is maximal margin This surface can be obtained from the solution of a problem of quadratic programming [23]

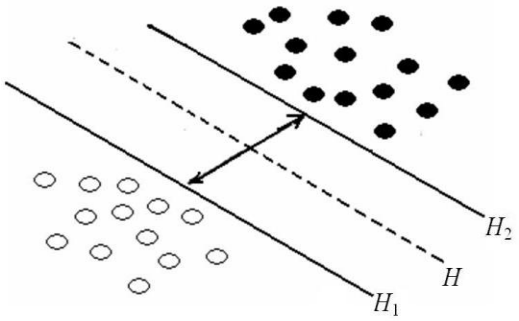

Fig 3.The optimal plane of SVM in linearly separable condition

IV. CONCLUSION

In this paper, we proposed a desion support system which identify various agricultural pests on various crops. After identification particular pest , system would give preventive as well as control measures which help the farmers to take correct action to increase production.

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