PEST CONTROL IN PADDY USING SEGMENTATION IN IMAGE PROCESSING

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Abstract: Paddy plantations are unique to India and a handful of countries throughout the globe. Essentially, the growing paddy with in India has enabled the plantation to fight many outbreaks of pests and diseases. Paddy plantations are under constant threat of pest and disease incidence because it favors the build-up of pest population. To cope with these problems, an automatic pest detection algorithm using segmentation in image processing techniques using IDL has been proposed. Image acquisition devices are used to acquire images of paddy plantations at regular intervals. These images are then subjected to pre-processing and clustering.

Keywords: pests, plantations, acquisition.

Introduction: Today there are more than 1000 organic pesticides and thousands of formulations. The paddy industry unfortunately relies on these poisons to protect the plant and seeds from insect attack and disease spread. In some advanced countries aerial spraying of these hazardous chemicals is carried out to save on labor costs. Most, paddy farmers advocate the use of BROAD SPECTRUM pesticides. These are more dangerous than systemic pesticides because they act on many insects both beneficial and harmful. There is every chance that these chemicals can easily drift to nearby ponds and lakes or get washed by heavy showers and reach groundwater there by contaminating the earth's precious water reserve. However, the cultivation of these crops for optimum yield and quality produce is highly technical. A lot of research has been done on modern paddy cultivation systems.

To protect paddy crops is to control pests and diseases by biological means instead of pesticides. Research in agriculture is aimed towards increase of productivity and food quality at reduced expenditure and with increased profit, which has received importance in recent time. A strong demand now exists in many countries for non-chemical control methods for pests or diseases like natural farming by applying natural manure. However no automatic methods are available which precisely and periodically detect the pests on paddy plants. In fact, in production conditions, staff periodically observes plants and search for pests. This manual method is time consuming. With the recent advancement in image processing pattern recognition techniques, it is possible to develop an autonomous system for disease classification of paddy crops.

First, regularly observe the paddy plants. Disease images are acquired using mobile phone cameras, digital cameras or scanners. Then the received image from the camera has to be processed to interpret the image contents by image processing methods. The focus of this paper is on the interpretation of image for pest detection

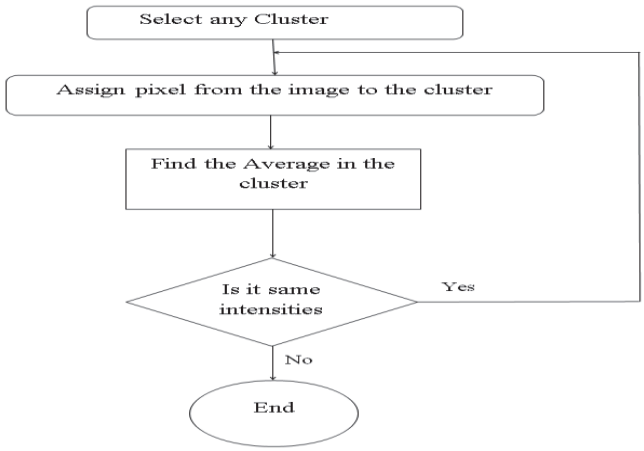
Image Segmentation: In computer vision, **segmentation** is the process of partitioning a digital image into multiple segments (sets of pixels). The goal of segmentation is to simplify the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries like lines, curves, etc. in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Each of the pixels in a region is similar with respect to some characteristic or computed property, such as colour, intensity, or texture.

Clustering Method: This is an iterative technique that is used to partition an image into clusters. Procedure of clustering method is explained in Fig1. Clusters can be selected manually, randomly, or based on some conditions [4] [7]. Distance between the pixel and cluster centre is calculated by the squared or absolute difference between a pixel and a cluster centre.

The difference is typically based on pixel colour, intensity, texture, and location, or a weighted combination of these factors. More commonly used clustering algorithms are K – means algorithm, fuzzy c-means algorithm, expectation – maximization (EM) algorithm. The quality of the final result of the clustering method depends mainly on the initial set of clusters. Since the algorithm is extremely fast, a collective method is to run the algorithm several times and select the best clustering obtainable.

Fig1.Flow chart for clustering Algorithm



A drawback of the clustering algorithm is that the number of clusters k is an input parameter. A wrong choice of k may yield poor results. The algorithm also assumes that the variance is an appropriate measure of cluster scatter. The following method can be employed to find the cluster centres.

1. Compute the intensity distribution (also called the histogram) of the intensities.
2. Initialize the centroids with k random intensities.
3. C (i) =arg min j $||X(i)-\mu j||^2$
4. Cluster the points based on distance of their intensities from the centroid intensities.
5. Compute the new centroid for each of the clusters.

Where k is a parameter of the algorithm (the number of clusters to be found), i iterates over the all the intensities, j iterates over all the centroids and μi are the centroid intensities. The k-means clustering was invented in 1956. The most common form of the algorithm uses an iterative refinement heuristic known as Lloyd's algorithm. Since the algorithm is extremely fast, a common method is to run the algorithm several times and return the best clustering found.

Advantages Of K-Means Clustering: In particular when using heuristics such as Lloyd's algorithm is rather easy to implement and apply even on large data sets. It has been successfully used in various topics, ranging from market segmentation, computer vision, geo-statistics to agriculture. It often is used as a pre-processing step for other algorithms. Other existing methods for image segmentation are compression based, histogram based, region growing methods, edge detection, split and merge methods, based on partial differential equations etc.

Proposed Method: The segmentation algorithm alone cannot provide good quality output, it needs pre-processing step. Pre-processing may consist of various steps like de-noising and image enhancement. De-noising provided with the median filter [8], which well suited for the pest image. It is non-linear filter, which preserve the shape, edge and other information without lack of clarity. Due to the irregularities and drawbacks in pest images [9], it is mandatory to include the pre-processing step before the segmentation process for the quality and accurate output. The proposed method is shown in Fig 2.

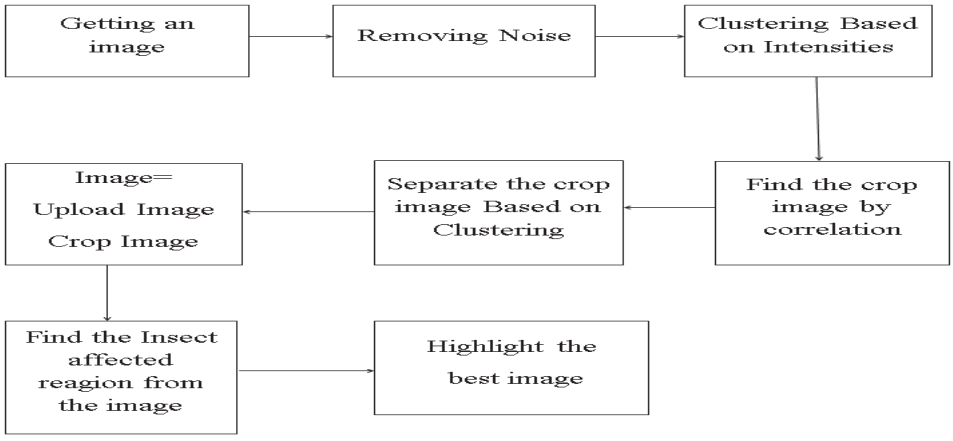


Fig.2 Block diagram for the proposed method

In the proposed method, pre-processing is added before the segmentation and volume estimation is added after the segmentation. Also an image subtraction step is added after the algorithm. Proposed method reduces the problems due to noises [3] [5] and other irregularities in acquired images and also it overcome the disadvantages like intensity in homogeneity and artefacts, etc.

Experimental Results:

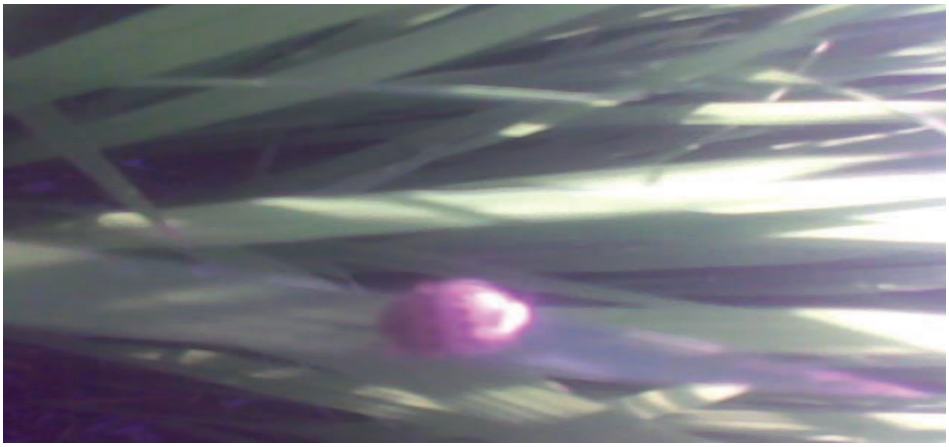


Fig3. Selection of paddy plantations affected with pests

The Fig3 shows the ROI selection of a infarction region. This selection helps to analyze the needed region alone. In this method, the pixels inside the rectangular mask alone are taken and the remaining pixels are left. It done by regularly capturing the field Images.

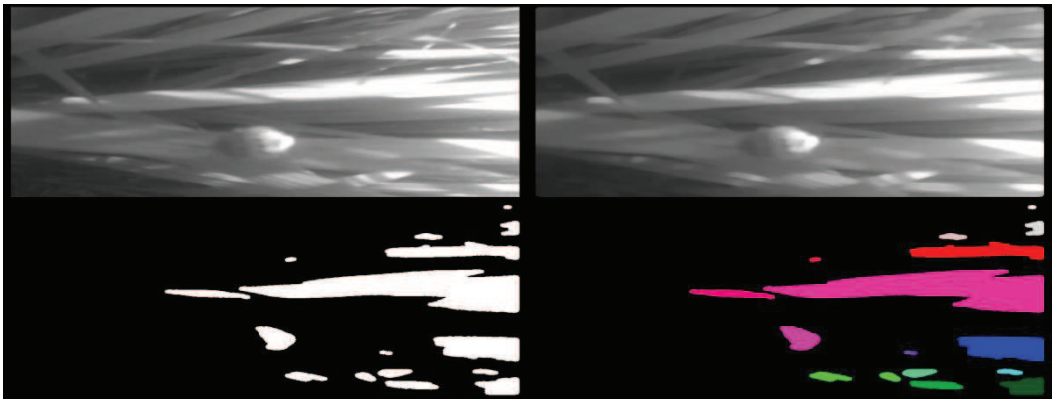


Fig.4. Clustering based on intensity and threshold separation

Clustering To Separate Plant and Pest Masking and Removing green pixels: Masking means setting the pixel value in an image to zero or some other background value. In this step, identify mostly the green coloured pixels. After that, based on specified threshold value that is computed for these pixels. The green components of the pixel intensities are set to zero if it is less than the pre-computed threshold value is shown in Fig4.Then red, green and blue components of this pixel is assigned zero value by mapping RGB components in s. The green coloured pixels mostly represent the healthy areas of the leaf and they do not add any valuable weight to disease identification .

Segmentation: From the above steps, the infected portion of the leaf is extracted. The infected region is then segmented into a number of patches of equal size. In this approach patch size of 32X32 is taken.

Obtaining Useful Segments: In this step the useful segments are obtained. The size of the patch is chosen in such a way that the significant information is not lost. Not all segments contain significant amount of information. So the patches which are having more than fifty percent of the information are taken into account for the further analysis.

PRO segmentation1

; Prepare the display device and load grayscale color

; table.

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DEVICE, DECOMPOSED = 0, RETAIN = 2
LOADCT, 0
; Select and open the image file.
file = FILEPATH('Image1.jpg', $
SUBDIRECTORY = ['examples', 'data'])
READ_JPEG, file, image, /GRAYSCALE
; Get the image dimensions and add a border to the
; image.
dims = SIZE(image, /DIMENSIONS)
padImg = REPLICATE(0B, dims[0]+20, dims[1]+20)
padImg [10 , 10] = image
; Get the size of the padded image and display it.
dims = SIZE(padImg, /DIMENSIONS)
WINDOW, 0, XSIZE = 2 * dims[0], YSIZE = 2 *
dims[1], $ TITLE = 'Opened, Thresholded and
Labeled Region Images' TVSCL, padImg, 0
END
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Conclusion: The use of Artificial insecticides have been degrading the quality of plantation crops for many years. In this paper a novel algorithm is presented for easily identifying the pest infected areas of these crops. The algorithm can be further modified for finding the diseased areas in the crops by using sophisticated software and better image acquisition devices. All over the world agriculture experts are working on eradication of bioagressors and infected paddy plantation[10] [11] are one of the challenges out of it. Image Processing technique plays a vital role in it. Our first objective is to detect diseases like stem borer and leaf folder on plantations and other bioagressors (aphids) or plant diseases. Cognitive approach introduce new objects to detect or new image processing programs to extract the corresponding information. The proposed method is a original approach for early detection of pest on crops and to detect biological objects on a complex background. The proposed method combined scanner image acquisition, sampling optimization, and advanced cognitive vision. It illustrates the collaboration of complementary disciplines and techniques, which led to an automated, robust and versatile system. The prototype system proved reliable for rapid detection of pests. It is rather simple to use and exhibits the same performance level as a classical manual approach. Goal is rather to better spot the starting points of bioagressors attacks and to count these so that necessary action can be taken.

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