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An Image Processing algorithm for pest detection

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Abstract: Pest infestation is the major problem facing by our farmers in agricultural field. This causes huge damage to food crops. In order to control pest infestation farmers use pesticides. Excessive use of pesticides is dangerous to animals, plants and also to human beings. It causes various health disorders such as breathing problem, skin cancer and many more. In order to overcome these problems proper use of pesticides plays an important role. To overcome the above mentioned problems, an efficient algorithm can be developed and Verilog implementation of image processing algorithms is implemented to detect the number of pests present in plants. This statistics can help in pesticide spraying.

Keywords: Pest infestation, Verilog implementation, pest count, amount of pesticides

I. INTRODUCTION

India is been called as "land of agriculture" and agriculture is the backbone of India. 75% of the total population of India depends on agriculture. It's necessary to get a good quality and quantity of crops. Various modern techniques have been introduced in order to help our farmers to yield a better quality and better quantity of food crops. But still our farmers are facing various problems to yield a better food crop and facing huge economic loss. The various problems which are facing by our farmers are: Irrigation problem, getting good quality of fertilizers and seeds, storage of the harvest, and major problem is pest infestation. There are number of solutions from the government for the above mentioned agricultural issues, except for pest infestation. There is no proper solution from the government for the pest infestation. Presently we can see various crops have been attacked by pests and farmers face huge loss in getting good quality and good quantity of crops which in turn causes economic loss to them. In order to overcome this problem farmers spray pesticides. To spray pesticides there should be better knowledge about the pests and the pesticides. Farmers face lots of problem without getting suitable information about pests and the pesticides. If a farmer sprays pesticides without proper knowledge he may face number of problems. And even by spraying pesticides manually he may face lots of health disorders like skin diseases, breathing problem, skin cancer and many other diseases. In order to overcome such issues in future a robot can be developed. This robot will spray pesticides based on the number of pests present on the plants and type of the pests present on the plants. This can be done only after the proper analysis of pest infestation.

II. LITERATURE SURVEY

A new method to detect the pest and finding its position by using binocular stereo in order to find in which location the pest is present. This information is used to guide the robot to automatically spray the pesticides. For greenhouse maintenance the pesticides has to be used in large quantity. By using excess of pesticides the environment is negatively impacted. So in order to reduce this even amount of pesticides has to be sprayed for the large canopy so that loss of pesticides can be minimized. To identify pest the difference in color features between leaves and pests is done by using image segmentation technique. Based on the image segmentation results and by using the technique called binocular stereo vision; 3D image of the pest is obtained. Here in this paper the results are showing that this method is reliable for depth measurement. But the noises may occur in illumination conditions and the pest size and color may give some measurement errors. [1]

There are many methods at present for the detection of grain pests, but these methods are not efficient because of its poor accuracy, less efficiency, difficulty in implementation, and not detecting in proper time, etc… In order to overcome these defects a wireless sensor is used to identify the quantity of grain pests and also species of the same. In this technique the detection technique electrodes is used in which the value of the capacitance changes when the pest is entered in the detection electrodes. The dielectric constant of the pests differs from one another due to different species. Based on the different capacitance range the species of pests is determined and the changing time is recorded to identify the grain pest quantity. The change in environment plays an important role here. If the temperature and humidity varies, it changes the capacitance value, and the alarm value has to be adjusted in time else it causes error. [2].

The crop management by using modern technique in greenhouse uses image segmentation technique. It is difficult to maintain the status of management in greenhouse manually. Instead of that it is monitored by using the cameras by adding some other automated techniques. The major problem in the greenhouse is the pest infestation. In greenhouse it's necessary to monitor the pest population accurately. Here segmentation technique is used in order to detect the presence of pest. Segmentation plays an important role in order to identify the difference between the pest and other parts of the image. Here entropy based thresholding is proposed and the comparison of results is done with the Fuzzy c-mean method. [3]

In India agriculture plays an important role. In present agricultural system the extraction of pests and detection of pest is done manually. By using manual methods we cannot achieve better accuracy and efficiency. Image processing algorithms has been proposed to identify the pest and to detect the number of pest by using extended region grow algorithm. Extended grow algorithm is limited only for counting and identification of pests and only 90% of the counting and identification is done using this. [4].

In agricultural field the detection of pest in paddy field is very much challenging. The effective methods have to be developed for pest infestation by which the use of pesticides can be minimized. Different processing techniques have been proposed in this to detect pest. This proposed system gives an efficient, simple and fast solution in pest detection in paddy fields. The experimental results provides a better technique for detecting pest but in future other image processing techniques can be developed in order to detect and extract pests more accurately and efficiently. [5].

III. IMPLEMENTATION

The flow diagram for the proposed approach is showed in the following figure 1.It shows the step by step procedure that has been carried to detect the number of pests present in plants.

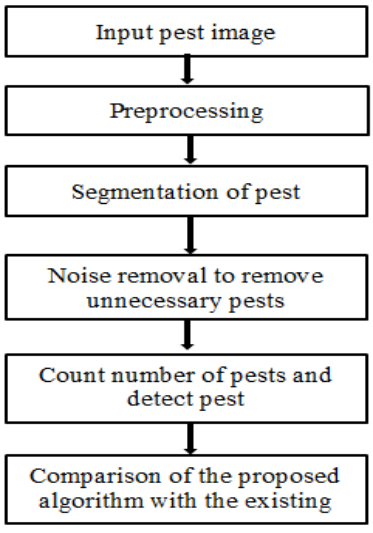

Fig 1. Flow diagram of the proposed system

Input the pest image: The images are collected from the database. The figure 2 shows the white pest images on plants that are collected from the database. After collecting the images, it is preprocessed in order to select suitable color model.

Preprocessing: The images are processed using different color models to select the suitable color model for the images that are obtained from the database. We use different color models such as RGB, YCbCr and HSV color model.

Fig 2. Images of White pests on plants

Saturation color model was selected as the best suited color model. Otsu and manual thresholding were tried and the best results were obtained in manual thresholding.

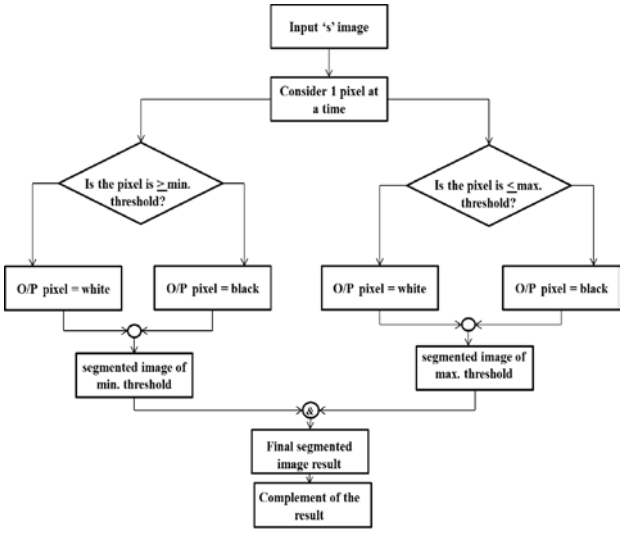

Fig 3. Flow chart of two level thresholding

Fig 4. Resulted image of thresholding

Noise removal: To remove unnecessary pixels noise removal is done. Noise removal is done by using erosion

and dilation process. Figure 5 shows the image of the pest obtained after removal of the noise.

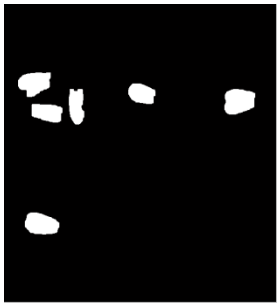

Fig 5. Image obtained after noise removal

IV. CONCLUSION

The algorithm was first tested in MATLAB R2011b and then the same has been implemented on FPGA using Verilog. As Otsu is intense when it comes to processing, the time consumed by manual threshold is much less.

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