International Journal of Advanced Computer Research
ISSN (Print): 2249-7277 ISSN (Online): 2277-7970
Volume-5 Issue-18 March-2015

Carving and Classification of Crops Weed Using Area Threshold

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Received: 03-March-2015; Revised: 06-April-2015; Accepted: 08-April-2015

Abstract

In the field of agriculture, weed is an unwanted plant. It consumes the resources of crop such as water, pesticides, space and grows at the superfluous place. These unwanted plants should be destroyed with the reliable method at reasonable price. In traditional method, farmers use more amounts of similar pesticides all over the field and it results in decrease of the soil fertility. Different weeds needs particular pesticide, use of same pesticide to all the weeds is less efficient. In this paper we provide framework to classify crops and weed using image processing techniques. Image slicing, labelling, and calculating the areas of the labelled objects are the components of our framework. We demonstrate the results for different weed areas and crop areas. The classification is satisfactory when the area of weed is less than crop. Our framework can be used in real time spraying machine to control the growth of weeds. We simulate the results using MATLAB2012a.

Keywords

Collection of image, Image slicing, Processing, Value for threshold.

1. Introduction

Weeds are grown unevenly in the field [6]. The cost of the pesticides is increasing every year and by using those will also decrease the soil fertility. Providing labour cost is not economical and it's time consuming too [7].

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This work was supported in part by the Department of Electronics And Communication Engineering B.V.B.CE.T, Hubli, India.

Hence controlling the weed is a necessary task in the agricultural field; this will definitely harm the crop yielding. Therefore, farmers need a solution for this weed control and that should be economical [8]. Conventional method was like spraying the pesticides all over the field, this method has many drawbacks such as it is time consuming and cost wise also its not affordable. Moreover weeds are unevenly grown and need to spray at specified areas. There will be more space which is not covered by the weeds so usage of pesticides simply all over field is insignificant [10].

In this circumstance, a solution should be in such a way that the spraying should be to the precise area where weeds are grown. There may be different kind of weeds grown at different section of field and those may need dissimilar pesticides to apply so that spraying of different pesticides is essential. By accomplishing this we can control the growth of weed efficiently. There are many approaches based on size, shape, pattern, colours and still more are used to differentiate between crops and weed [9]. Based on the location the classification between crops and weed differs. Earlier what the people have done in the field of classification of crop and weeds are as follows.

The primary stage in identifying the weed present in the input image is to spot the pixel and classify them, the need for carving between plants and soil is to find out the quantity of plant section occupied in the definite region. If the area is lesser than threshold it is a besieged spot for spraying pesticide [9]. In image processing binarization is titled as the threshold, it takes the image and converts it into single bit image either zero or one, which has the methods to obtain the binary image, binary image is like extracting the text, crop etc [1]. Generally binarization works on grayscale image. By excluding the back ground, they used threshold and filtering. The FFT is used mainly

to reduce the noise, digital signal process, image reconstruction; using frequency filter to recognize the regions in lines which appear with specific frequency [2]. The texture is the specified patters meant for the objects; the plant leaf can be identified by excluding the background by converting the image into binary and removing the background using threshold [3]. The value for threshold is selected to categorize crops and weed but care should be taken to collect image whose area of weed is smaller than crop [4]. For carving the pixel with similar regions are placed together. The classifier is based on the hyderspectral camera; the camera is used to collect the images, which has RGB information that is used to gather spectal information [5].

The paper provides the stepladder to differentiate between crops and weed.

1. Collection of image and apply gray transformation.
2. Carving the image and pass it through the filter like median to remove the noise.
3. Classify the crops and weed.

Steps used for classification of crops and weed are explained below.

Area threshold is the optimum method to obtain the considerable classification of images. In this method, execution is depending on the size of the crop. Digital camera (Nikon) is used to capture the image. These images are converted from color images to gray to decrease the execution time. Convert the image into binary image. Finally the classification measurement, initially we had determined the areas occupied by the crops and weed. Based on the area covered we are going to determine which one is crop. This classification holds fighting fit only when both crops and weeds are present in same image and they should not overlap on each other. If they overlap this method fails. Fig.2. shows the original image chosen for testing purpose.

2. Methodology

The block diagram is as shown in the Fig.1, contains collections of images gray transform carving labeling removing the unwanted materials and classifies crops and weed.

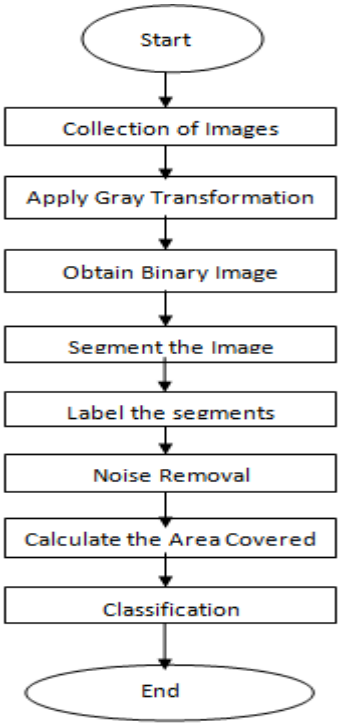

Fig.1: Block Diagram of the System

Important steps to carry out are briefed here extracting the green color from the image is performed mainly to decrease the execution time and decrease the complexity in execution. Separate the plants from the background i.e. soil, sky etc. [10] carve the image and classify crops and weed using area threshold. Comprehensive information of the framework has been explained gradually.

2.1 Collection of Images

As many as colour photographs of crops and weed are captured by using the digital camera (NIKON), these are captured during different time and lighting conditions. The camera was placed at a height of three metre from the ground during capture. While taking the images its resolution was high around 3500*2700 during test time its resolution has been decreased to 300*200, this alternation was mainly done to decrease the execution time. The Fig.2 shows some of the weed and crops captured using the digital camera.

2.2 Application of Gray Transform

The main reason for including this step is to convert the colour image into black and white i.e. to reduce the colour content in the image to diminish the execution time as reading the colour image in mat lab requires more time compared to grayscale image. After conversion there should be considerable difference between the soil and plant. From every pixel we are doubling the green content by multiplying by the factor two and subtracting with red and green colour and results of it are as shown in the Fig.3 and Fig.4. Individually the colours are obtained by image using (1)

```
R=image (:,:, 1);
G=image (:,:, 2);
B=image (:,:, 3);
```

(1)

Fig.2: Original Image

Fig.3: Red Colour Extracted From Original Image

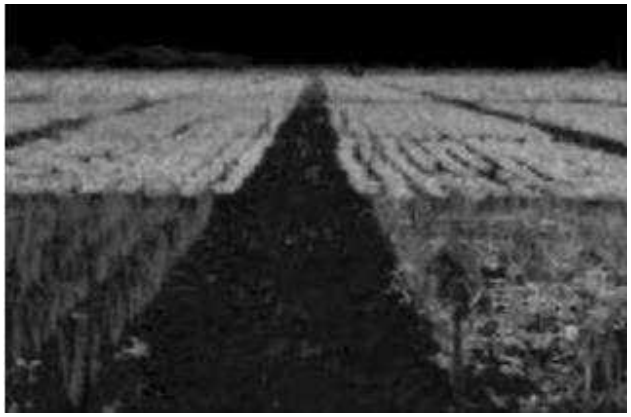

Fig.4: Blue Colour Extracted From Original Image

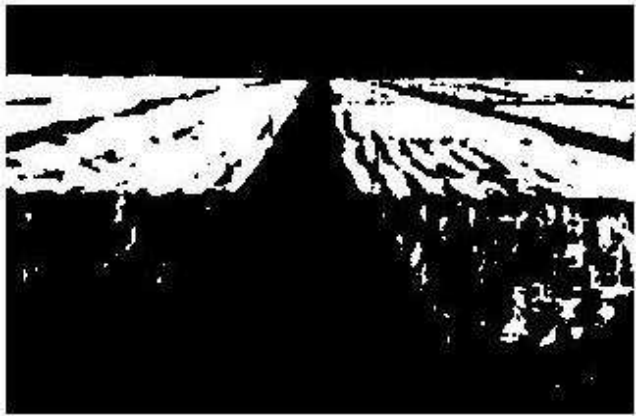

Fig.5: Binary Image Obtained from Blue Colour Extracted Image

Fig.6: Filtered Image of the Binary Image

2.3 Slicing of Image

This step is applied only to the binary image therefore grayscale image is converted to binary image in the gray transformation step. To remove the background present in the image like soil, sky etc there are many methods like watershed segmentation, colour segmentation, edge detection but during test time we used the method called as deduction of gray used for carving the image. The image is gets converted into binary image i.e. only one bit is used to represent the image either black or white. The threshold is set based on the values obtained by green minus red and green minus blue. Further rest of the steps are carried out on binary image.

For the pixels present in the image, typical values of green minus red and green minus blue are calculated. If green minus red and green minus blue is greater than threshold it is classified as plant if not, then it is classified as background. Ostu's method is used to reduce the gray level to the binary image the resultant image is as shown in Fig.5.

In this method it makes two classes first is background pixel and another is a part nearer to observer, it will automatically decides a line between two classes and provides an optimum level to create a binary image. To reduce the noise present in the binary image, pass it through any filters; during the filter stage whichever pixel possesses lesser area will be discarded the resultant image is as shown in Fig.6.

Fig.7: Detected as Crop

Fig. 8: Detected As Weed

2.4 Classification

This step is the absolute step to classify between the crops and weed; the sliced image will be an input for this step. We are going to label the images which are carved at the previous stage. During test time eight connected components are used to label, there are two types in labelling namely four connected components and eight connected components, the four connected components checks for two directions from its current pixel, if the same pixel is found it is going to label that pixel to same class, by providing a random number. The advantage of using eight connected components is that like it is going to check in three directions from a current pixel with neighbouring pixel if similar pixel is found then it is graded under the same class. It will be easy to calculate the area of the labelled regions instead of finding the area individually.

We know that in the previous step labelling process has been carried out for every segmented image; it becomes easy to calculate the area for these labelled parts as separate objects. The classification is as shown in the Fig.7 and Fig.8.

The classification is illustrated in the equation. (2) If the area is less than thousand classified as weed or else as crop

$$\text{Image} \begin{cases} \text{Area greater than threshold; Crop} \\ \text{Area lesser than threshold; weed} \end{cases} \quad (2)$$

Threshold is 1000

Misclassification results are as shown in Fig.9.While collecting the images care should be taken such that weed and crop both should be present in the single

image; if not the classification fails and other few instances where this method fails are as follows.
When the area covered by weed is same or greater than crop.

If weed and crop are overlapped. Fig.9. shows that the crop and weed are overlapped as of this algorithm fail to classify crops and weed.

Fig.9: Original Image for Misclassification

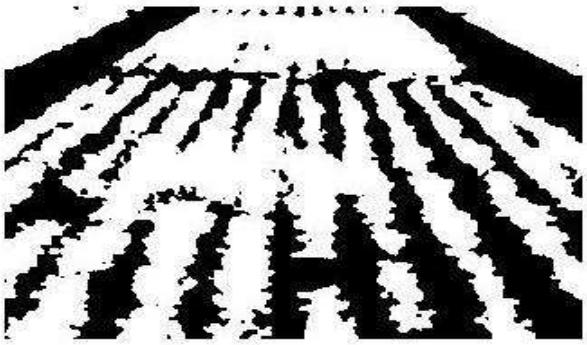

Fig.10: Detected As Crop

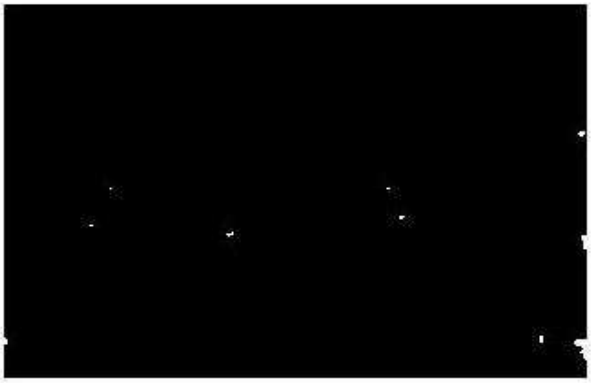

Fig.11: Detected As Weed

Fig.10. shows the one such case for the cause for misclassification, here crop and weed are overlapped therefore the classification fails at this instant. Fig.11. shows the weed classification, the weed is misclassified as the crop.

3. Results

The paper presented an algorithm to classify between crops and weed, the Fig.3 shows the results for classification, this method can be adopted for the spraying the herbicides, most of the images which are captured at the initial phase are successfully classified and can work reliable on the herbicides mist machine. At the early stages of plant growing using pesticides is preferable as growth of weed is decreased therefore we can successfully classify the weed. Some of the images which were having frequency to left side of histogram can cause inaccuracy during classification and during misting the chemicals. Tested this algorithm by collecting eighty images out of eighty sixty eight images classified accurately and twelve are misclassified as per the tested images this method achieved about eighty five percentage of accuracy. Fig.12. shows the table statics and accuracy of the algorithm.

Table 1: Result Statistics

No. of Images Tested	Classification	Misclassification
80	68	12

4. Conclusion and Future Work

By using area threshold we can reliably classify the images as weed and crops so it can be implemented to real time application. The image slicing method is very important step in area threshold as it is used for calculating the area. The time of image capture also matters during classification. For the captured images the algorithm worked reasonably. The weed and crop should not be overlapped on each other which help to classify weed and crops.

Acknowledgement

We are heartily thankful to University of Agricultural Sciences to provide a golden opportunity to collect the data on varieties of crops and as constrains of weed in detail.

This study helps a lot to enhance our knowledge pertaining to the above subject and update our knowledge. With pleasure thanks a lot.

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