IJCSE International Journal of Computer Sciences and Engineering Open Access
Survey Paper Volume-4, Issue-6 E-ISSN: 2347-2693

A Survey on Weed Detection Using Image Processing in Agriculture

Jatin Choudhary[1*], Sutapa Nayak[2]

[1]Computer Science & Engineering, Kalinga University, Raipur (CG) India
[2]Computer Science & Engineering, Kalinga University, Raipur (CG) India

www.ijcseonline.org

Received: May/16/2016 Revised: May/30/2016 Accepted: Jun/18/2016 Published: Jun/30/ 2016

Abstract— Agriculture is one of the most important origins of human sustenance in whole world. Due to increasing population peoples require more productive capacity of the agriculture to fulfill the demands at present. In the past, we used natural methods to grow the productivity, such as using the cow dung as a fertilizer in the farms. That resulted in grow in the productivity according to demand of the population. But later we thought of growing more profits by getting more result. Therefore, there came a revolution named "Green Revolution". After this period demand of dangerous poisons like herbicides has increased beyond limit. By getting so people got result in growing the productivity but people have ignored the side effects spread to the Eco system, which will raise suspense in our sustenance on this dangerous environment. So, in this research, we have tried to implement some techniques or methods to decrease the usage of herbicides by using them only in the geographical areas where weed available and destroying the crops. In this paper, we have used image processing using MATLAB to identify the weed place in an image which has been taken from the fields.

Keywords: Weed Detection; Plant Reflectance; Visual Texture; Inter Row Weed Detection.

I. INTRODUCTION

In previous days weed detection was done by employing some men especially for that purpose. They used to detect the weed by moving and checking each and every area of the field. Then they plucked them out manually using their own hands it was comparatively time consuming process and also could be possible to disturb the crop due to lack of knowledge. Later with the modernization in the technology people started using the herbicides to remove the weeds. But to detect the weeds peoples are still using extra man power in many parts of the earth. Later there introduced some methods to identify the weeds with computerized technique but due to lack of their accuracy methods are unable to reach to the population. Then image processing was started in use for this purpose. In this paper our main aim is to detect the weed available in the farm with the help of image processing. Then we will give the inputs of the weed areas to an automatic spray pesticide only in selected areas. For this purpose we need to capture a photograph of the infected field with best clarity to identify the weeds with more accuracy. Taking a photograph can be done by attaching a camera to a tractor or taking them manually. Then we will apply image processing so that image using MATLAB to detect the weed.

WEED: A weed could be a plant thought-about undesirable. Weeds haven't any biology classification since a plant that's a weed in one reference isn't a weed once growing wherever it's wished. It's applied to any plant that grows or reproduces sharply or is outside its native surroundings. The term is often wont to loosely describe species outside the kingdom Plant that may sleep in various environments and reproduce quickly. In step with the weed science analysis,[1] regarding 33% of the overall losses by agricultural pests square measure caused by weeds solely, as shown in figure one. not like different pests, weeds have an effect on the majority crops. Thus it's necessary to reduce the losses caused by weeds. Correct coaching and reorientation of the personnel of the state agricultural departments is additionally essential for triple-crown management of weeds. Figure a pair of shows the Indian situation of chemical usage. Herbicides employed in India square measure lesser as compare to the worldwide situation. The consumption of pesticides takes the main share (>two-third), whereas the chemical use is barely >20%. However, the chemical use is predicted to extend by 15-20% every year within the future. The herbicides registered in India square measure of low class toxicity, and most of those square measure applied early in season, in order that the waiting amount will be earned by the harvest [3].

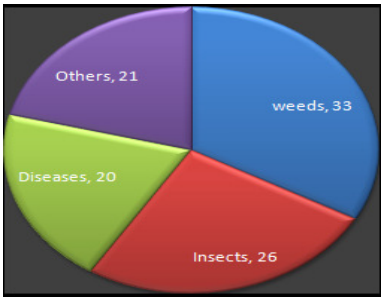

Figure 1: Crop yield losses caused by weeds and other pests

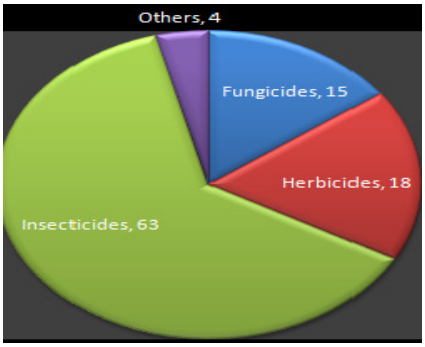

Figure 2: Indian scenario of pesticide use in India

There are basically many techniques used to detect the crop and weed in the agriculture field.

A. Biological Morphology Based Technique

In biological morphological from and size options area unit extracted. Form options like, major axis, areas, minor axis, ratio, breadth area unit used for detection of plant. Hidden options are found with the assistance of biological morphological technique. Within the technique the excessive inexperienced colure rule for segmentation of soil and vegetation used, subsequently median filtering for removing the noise, morphological options and calculation of applied math threshold price. Using this, they got 72.6% of exactness. Seven form options for detection of crop and weed is employed however this can be restricted to just for corn crop and that they got the accuracy 98.9% [3].

B. Plant Reflectance Based Technique

Spectral coefficient technique is employed for plant species identification. Spectroscope is important to record spectral coefficient parameter however price is beyond the common former will offered. numerous forms of spectral coefficient parameter is employed like for vegetation indices, to live crop properties within the spectrum generally ratios of broadband coefficient values are used. The options like, variance of the close to spectrum, skewness, average provides the high level of success in color segmentation. Piron et al got 72% of accuracy in their projected system for detection of weed in carrot rows [3].

C. Visual Texture Based technique

In this technique texture features of the image such as, energy, entropy, contrast, homogeneity, and inertia are used for detection of plant. By using the support vector algorithm and extracting the texture features energy, entropy, inertia, homogeneity, contrast and relegated got the 93% of precision. Kiani S, verified that different ANN gives different accuracies with five texture features energy, contrast, homogeneity, inertia, entropy as a input to the ANN. Gabor wavelet combined with PCA algorithm got 90.5% of precision. In this paper wavelet transform Db4 is used for extracting the texture features of crop and weed images [3].

D. Inter Row Weed Detection

In this technique we are able to find the weed that's gift in between the rows of the crop. Here it'll method the photographs taken in real time to urge the weed areas. We are going to take photos at twenty five frames per second. Every frame has to be operated for 0.04 sec. Here we are going to take the primary eight frames generated in 0.3 sec time and that we can perform the logical AND operation between them to urge a reference image known as crop row image. This reference crop row image are going to be modified when zero.3 sec and can get replaced by the new crop row image shaped by the AND operation of the frames obtained in next 0.3 seconds [3].

E. Inter Plant Weed Detection

Inter row weed detection doesn't wear down the weed between the plants within the rows. So as to beat this drawback lay to rest Plant Weed Detection is used.

II. RELATED WORK ON WEED DETECTION

There are few approaches exist that, may be used for our solution, try to solve the problem of weed detection. These approaches protect the crop while plants grow up in the farm. Weed detection is now a big challenge for every farmer; it causes maximum loss of crop and decrease the productivity of farming. Many techniques which are implemented by the authors some are as follows:

1)Title: Weed detection using image processing
Author: Ajinkya Paikekari, Vrushali Ghule, Rani Meshram, V.B. Raskar.
Publication Year: 2016 IRJET
Method: Weed with narrow leaves, Weed with wide leaves
Finding: In the above methods affect the threshold value in this way: if authors have narrow crop leaves and wide weed leaves then they can say that weed has more edge frequency than the crop, so here the threshold value will be more. Otherwise, the threshold value will be less. In this paper, they take the case of corn crop where the edge frequency of weed is more than that of the crop. For knowing the value of the edge frequency here, first, they took an image which contains pure weed and calculated the number of edges in it by using "for" loops and then they have calculated the number of edges per block for pure weed. That turned out to be approximately 350. Then they did the same by taking pure plant image and its edge frequency is approximately 210.

2)Title: Digital Image Processing Applications in Agriculture
Author: Janwale Asaram Pandurng, Santosh S. Lomte
Publication Year: 2015 IJARCSSE
Method: Crop and Land Estimation and Object Tracking.
A particle filter (PF) was introduced to develop a data assimilation strategy using the Crop Environment Resource Synthesis (CERES)—Wheat model.
Finding: In the Methodology 2 experiments involving winter wheat yield estimations were conducted at a field plot and on a regional scale to check the feasibleness of the PF-based information assimilation strategy and to research the results of the PF parameters and spatiotemporal scales of assimilative observations on the performance of the crop model information assimilation. The numerous enhancements within the yield estimation recommend that PF-based crop model information assimilation is possible. Winter wheat yields from the sector plots were forecasted with a determination constant ( ) of 0.87, a root-mean-square error (RMSE) of 251 kg/ha, and a relative error (RE) of 0.95%. A suitable yield at the county scale was calculable with a 0.998, a RMSE of 9734 t, and a RE of 4.29%.

3) Title: Crop and Weed Detection Based on Texture and Size Features and Automatic Spraying of Herbicides.
Author: Amruta A. Aware, Kavita Joshi
Publication Year: 2016 IJARCSSE.

Method: Biological Morphology Based Technique, Plant Reflectance Based Technique, Visual Texture Based technique .

Finding:

Labeling Algorithm

In connected element labeling image is scan element by element that's from high to all-time low and left to right for establish connected element regions. Regions of adjacent element share constant set of intensity values. In our system we tend to used binary input image and eight properties.

Wavelet remodel

Wavelet is multi resolution tool. Ripple remodel have benefits over a Fourier remodel, sharp spikes and signal contain separation. In planned system distinct remodel is employed. Continues remodel troublesome} to implement and difficult to seek out out the scaling perform. ripple remodel is employed for feature extraction of weed and crop images. In line with the research worker. Daubechies ripple _db4'is used for texture feature extraction.

4) Title: Crop Detection by Machine Vision for Weed Management.

Author: Ashitosh K Shinde, Mrudang Y Shukla

Publication Year: 2014 IJAET

Method: Size based feature Extraction

Size based features can be extracted by using Mathematical morphology. Morphology is an approach to image analysis which is based on the assumption that an image consists of structures which may be handled by set theory. This is unlike most of the rest of techniques.

Findings:

Crop Masking: when eminent detection of weed by completely different techniques, it's necessary to search out the weed in a picture for that crop detected is cloaked with black color by finding the origin, length, dimension of every bounding box the result.

Weed Detection: when the crop masking weed is detected by applying excessive inexperienced rule the weed is detected. The bounding box rule is performed on the image to map the weeds. Once the weed is mapped by bounding box. Rule to search out the co-ordinate of the every bounding box is developed and performed and also the co-ordinate of every detected weed is written.

5) Title: Image Processing in Agriculture

Author: Mrs. Latha, A Poojith, B V Amarnath Reddy, G Vittal Kumar.

Publishing Year: 2014 IJIREEICE

Method: Inter row weed detection, Inter plant weed detection.

Finding: The image when each color segmentation and edge detection is left with the perimeters and veins of each the crop and therefore the weed in white and therefore the remaining half fully black. Though many subtle and correct strategies for color segmentation exist, several of them don't seem to be quick enough for period of time functions. As in color segmentation, many strategies with completely different accuracy and speed are obtainable that their most well-known ones are cagey and Sobel edge detection algorithms. The operations like color segmentation, edge detection build the image prepared for successive operation known as filtering.

6) Title: Weed And Crop Segmentation And Classification Using Area Thresholding.

Author: Su Hnin Hlaing, Aung Soe Khaing.

Publishing Year: 2014 IJRET

Method: The algorithm consists of five fractions: (i) preprocessing, (ii) Binarization using Otsu"s thresholding, (iii) Marker control watershed segmentation, (iv) Gray transformation and (v) classification based on intensity. The simple weed and crop images are used to test the system.

Firstly, the color images are converted to gray scale images for easy and fast processing. Median filter is applied to the gray image to reduce the amount of data. Otsu"s method is used to filtered image for converting black and white image. This method chooses the optimal threshold to minimize the intra class variance of the black and white pixels. Then, binarized image is divided into different regions according to watershed segmentation method. The sobel operator is applied on the binary image to find the gradient magnitude. By using this magnitude, estimate the watershed transform that divide different regions. The segmented image is changed into RGB segmented image to distinct region. To classify weed and crop, the RGB image is converted into gray image. Finally, the intensity value is defined by manually to extract weed plant from the image.

Finding: This paper presents 2 main algorithms for weed and crop organisation. The plants with blue color area unit outlined as weeds and therefore the red plants area unit classified as crops. The given algorithmic program processes 2 styles of pictures for weed and crop. The algorithmic program created reliable classified pictures to be sprayed. Within the field, virtually the photographs that captured in step with image acquisition step will be classified to present to the spray system. By victimisation the resultant image, the weed position will determined in step with the pixels of left to right and high to bottom. Though the system might classify weed to be sprayed, darker pictures cause additional errors within the segmentation and conjointly in later steps of the algorithmic program. Once the weed and crop plants area unit overlapped, this methodology cannot classify weed and crop. The forty one sample pictures are wont to take a look at during this study. Among them, seven pictures area unit found the misclassification. Therefore the planned algorithmic program is appropriate for weed and crop segmentation and classification. it'll support to urge the reliable ends up in period application.

III. CONCLUSION

Existence of weeds on earth since men started cultivating. Each vegetation gift within the agricultural field that is unwanted is named as weed. Weeds vie with crop for daylight, Space, Water and Nutrients within the soil. Weeds area unit the foremost underestimated crop pests in tropical agriculture though they cause most reduction/loss within the yields of crops than alternative pests and diseases.

Image analysis is a good tool for non-destructive analysis of agricultural objects, and has been wide employed in agriculture. Improvement in digital image taking devices and code to work on pictures has contributed during this. The most advantage of image analysis is its potential for non-destructive and objective analysis.

Image process technique has been tested as effective machine vision system for agriculture sector. Imaging techniques with totally different spectrum like Infrared, hyper spectral imaging, Remote sensing were helpful in crucial the vegetation indices, cover measuring, land mapping etc with larger accuracies. Weed classification that affects the yield are often properly classified with the image process algorithms.

REFERENCES

[1] Ajinkya Paikekari Vrushali Ghule, Rani Meshram, V.B. Raskar," Weed detection using image processing " Volume-3, Issue-3, Page No (1-3), IRJET 2016.

[2] Janwale Asaram Pandurng, Santosh S. Lomte " Digital Image Processing Applications in Agriculture", Volume-5, Issue-3, Page No (1-3), IJARCSSE 2015.

[3] Amruta A. Aware, Kavita Joshi, "Crop and Weed Detection Based on Texture and Size Features and Automatic Spraying of Herbicides", Volume-6, Issue-1, Page No (1-7), IJARCSSE 2016.

[4] Ashitosh K Shinde, Mrudang Y Shukla," Crop Detection by Machine Vision for Weed Management", Volume-7, Issue-3,pp (818-826) IJAET 2014.

[5] Mrs. Latha, A Poojith, B V Amarnath Reddy, G Vittal Kumar, "Image Processing in Agriculture", Volume-2, Issue-6, Page No (1-4), IJIREEICE 2014.

[6] Su Hnin Hlaing, Aung Soe Khaing, "Weed And Crop Segmentation And Classification Using Area Thresholding", Volume-3, Issue-3, Page No (1-8) IJRET2014.

Authors Profile

Mr. *Jatin Choudhary*, MCM from Pt. Ravishankar University, Raipur (C.G.), pursuing M. Tech in Computer Science & Engineering, Kalinga University, Raipur (CG) India.

Ms. Sutapa Nayak, Asstt. Professor, dept Computer Science & Engineering, Kalinga University, Raipur (CG) India.

