A Survey on Weed Detection using Image Processing

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Abstract: **Agriculture is the origins of human sustenance in this world. The detection and classification of weeds are of most important technical and economical importance in the agricultural industry. In past days weed detection was done by employing some men, particularly for that intention. In olden days, weed detection was done by inspecting each and every place in the field. Then weeds were manually removed. Later with the improvement in the technology, people started using herbicides to take out the weeds. But to identify the weed still physical power was used in many parts of the world. Later there came few methods to discover the weeds without human intervention but due to lack of their accuracy, they were incapable to reach to the public. Then image processing was used for this purpose. In future it is planned to detect the weed in the crop by using image processing techniques. This paper focuses on survey of weed detection using image processing techniques.**

Keywords — Image processing, weed in crop, classical classifier.

I. INTRODUCTION

A weed is a plant growing along with the useful agriculture products.A weed may be defined as any plant or vegetation that interferes with the objectives of farming or forestry, such as growing crops, grazing animals or cultivating forest plantations. This weed decreases the growth of the crop and reduces the farm yield; hence these weeds should be identified and classified. The classification of weeds is helpful for adopting weed management methods for particular group of weeds instead of against an individual weed species. Fig1 shows the different types of weeds. These weeds are growing along with crops in the field i.e., shown in the fig 2. Weeds can extract the nutrients crop for this reason it will effects to crops.

Fig 1: Different Types of Weed

Fig 2: Weed in crop row field

II. METHODS

Methods for weed detection using image processing as follows

A. Image Acquisition

Images of weed are taken from online dataset or from crop field using high resolution camera for more accuracy in RGB format. Each obtained image is stored in respective size and in jpg format.

B. Pre-processing

Obtained images are affected by the various factors such as noise, lighting variations, poor resolution of an image and unwanted background. In pre-processing some tools are used for RGB to Gray scale conversion, Gray scale images to binary image, filtering techniques are used to remove the noise and unwanted objects from background.

C. Feature Extraction

After pre-processing features are extracted for detecting the weed. Feature extraction is process of defining a set of features, for the efficient representation of the information for analysis and classification. Different types of features are texture features such as entropy, energy, contrast etc., size shape and colour based features are to extract the features.

D. Classification

Classification techniques are used to classify the weed. Feature vectors are passed as input to the classifiers. In classification classifiers are trained, validated and tested using images of different weed. Some classifiers are artificial neural network, probabilistic neural network genetic algorithm and edge based classifier etc...

III. LITERATURE SURVEY

Many researchers developed the weed detection by designing algorithm for Segmentation, feature extraction, representation and classification. Some of the recent techniques presented in the papers are summarized in the following:

In [1] author describes "**Weed detection using image processing**" how they can detect and separate out weed affected area from the crop plants using image processing. The motivation for increasing such technique is to identify and reuse weed affected area for more seeding. This specific area can be considered for further weed control operations, resulting in more production. They have implemented various methods such like color segmentation and edge detection to decrease the handling of herbicides by spraying them only in the areas where weed was present.

In [2] author proposed "**Removal of weeds using Image Processing** identification and classifications of weeds are of most important technical and economical significance in the farming industry. Weeds are extracted from images using image processing and described by shape, color and size features. These features were use to classify similar weeds and crop species. They described different classification techniques like SVM, NN, DA and methods like Otsu's, 2G-R-B which are used to differentiate weeds and crops. He analyzed all the features of these methods and techniques. In this document his main aim is to review the methods for detecting the weed in the crop by using image processing.

In [3] author "**Crop detection by machine vision for weed management"** weed could be detected by using machine vision technique. Machine vision uses unique image processing technique. Weeds in agricultural field had detected by its properties such as Size, Shape, Spectral Reflectance, Texture features. In this document they have demonstrated weed detection by its Size features. After the image acquisition Excessive green algorithm was developed to remove soil and further avoidable things from the image. Image enhancement techniques are used to eliminate Noise from the images, By using Labeling algorithm each components in the Image were extracted, then size based features like Area, Perimeter, longest chord and longest perpendicular chord have calculated for each label and by selecting suitable threshold value Weed and Crop segmentation is done.

In [4] author proposed **"Detection of Weeds in a Crop Row Using Image Processing"** weed control was essential and critical operation and could affect crop yield. This document proposed two methods: crop row detection in images from agriculture fields with high weed difficulty and to further differentiate between weed and crop. Firstly, for crop row detection the image processing includes three main processes: image filtering, image segmentation using Otsu's method, and crop row detection. Secondly, further classification among weed and crop, is carried out by using box plotting technique. The proposed technique was tough against lighting due to environmental conditions.

In [5] author proposed "**Crop and weed detection based on texture and size features and automatic spraying of herbicides**" they developed the image processing algorithm for yield finding and management of weed. Five texture features are used for detection of crop. These five features are energy, entropy, inertia, local homogeneity and contrast. Morphological size based features are also used for detection of crop and weed. Compared the all results and taken majority decision for detection of crop and weed. Image segmentation combines image processing techniques in categorizes to take out cell from the image. The decision making determines the cells to be sprayed. Further the Cartesian robot manipulator is developed to locate the weed position on real field by calculating the coordinates to selectively spray the herbicides.

In [6] author proposed **"A computer vision application to detect unwanted weed in early stage crop**s**"** application for computer vision to detect unnecessary weed in crops from one area with extra agricultural impact. An Image processing was developed to get the region of attention were finally processed throughout neural networks. He proposed some methods like image acquisition, segmentation and ANN. They improved in the method by applying herbicides, in the exacting case of this application, image processing was a important aspect since obtaining the mask and the identification of regions of interest, taking same levels of light intensity, and it was a major challenge.

In [7] author proposed **"A Novel approach for weed classification using curvelet transform and tamura Texture feature (CTTTF) with RVM classification"** weed is a surplus plant growing along with the useful agriculture products. These weed also consume the water from the soil which will direct to in adequate water for the useful agro-products, for this reason these weeds would be identified earlier and removed. This document present an efficient curvelet make over and patch level tamura texture feature extraction method for weed classification. The relevance vector machine classification technique was developed for crop and weeds classification and weed partition. The results were compare support vector machine and with random forest classifier technique. The planned method outperforms all the other transform in conditions of correctness, specificity and sensitivity.

Table 1: Table of Review.

SL.NO.	Title of the paper	Author name	Method
1	Weed detection using image processing	Ajinkya Paikekari, et al.,	colour segmentation and edge detection
2	Removal of weeds using Image Processing	Riya Desai, et al.,	shape, colour and size features and SVM
3	Crop Detection By Machine Vision For Weed Management	Ashintosh K Shinde, et al.,	Size, Shape, Spectral Reflectance, Texture features and MVT
4	Detection of Weeds in a Crop Row Using Image Processing	A Satish kumar, et al.,	image filtering, image segmentation using Otsu's method, and box plotting
5	Crop and Weed Detection Based on Texture and Size Features and Automatic Spraying of Herbicides	Amruta A. Aware,	energy, entropy, inertia, local homogeneity and contrast
6	A computer vision application to detect unwanted weed in early stage crops	Batriz Nathlia, et al.,	image acquisition, segmentation and ANN
7	A Novel approach for weed classification using curvelet transform and tamura texture Feature (CTTTF) with RVM classification	P. Prema,	Vector Machine classification

IV. CONCLUSION

This paper presents a survey on weed detection using image processing techniques used in an agricultural context. Employing the processes like segmentation, feature extraction and clustering can be used to interrogate images of the crops. There is a need to select the most appropriate techniques to assist decision-making. The image processing techniques have been used across a vast range of agricultural production contexts. The accuracy of classification varies depending on the algorithms resolution of images and limitations of image acquisition.

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