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A Study on Weed Detection Techniques

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ABSTRACT

Agriculture is the spine of human food on this world. Presently a days with developing populace we require the efficiency of the agribusiness to be expanded a part to meet the requests. In long time past days they utilized common strategies to extend the efficiency. The identification and classification of weeds are of major technical and temperate significance within the agrarian industry. Weeds are extricated from images utilizing image processing and portrayed by shape, colour and estimate features. These features are utilized to classify distinctive weeds and crop species. In this paper, we depict diverse classification procedures like SVM, ANN, Decision Tree, Discriminant Analysis and KNN. In this paper our fundamental point is to review the strategies for recognizing the weed within the crop by utilizing image processing.

Key words :Image Processing, Weeds, SVM, ANN, Decision Tree, Discriminant Analysis.

1. INTRODUCTION

Rural division has indicating to natural conditions to guarantee quality and security of crop production; this approach is based on innovative improvement to support soil preparation, planting and weed expelling processes. Especially, among the foremost imperative crop issues lie in weeds development, which increment the biological competition; causing a better utilization of supplies such as fertilizers and water. Encourage, delays in item conveyances are produced, in fact, exists a impressive sum of working hours for review and weed removal.

In long time past days weed detection was done by utilizing a few men particularly for that reason. They will distinguish the weed by checking each and each place of the field. At that point they will cull them out physically utilizing their hands. Afterward with the headway within the innovation they begun utilizing the herbicides to expel the weeds. But to identify the weeds they are still utilizing manual control in numerous parts of the world. Later there came few strategies to distinguish the weeds naturally but due to need of their accuracy they are incapable to reach to the individuals. At that point they begun utilizing image processing for this purpose.

A weed may well be a plant thought-about undesirable. Weeds haven't any science classification since a plant that's a weed in one reference isn't a weed once developing wherever it's wished. It's applied to any plant that develops or duplicates strongly or is exterior its local environment. The term is regularly wont to loosely portray species exterior the kingdom Plant that will rest in different environments and replicate quickly.

Fig 1 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 crop

Figure 1: Different Types of Weed

Figure 2: Weed in crop row field

Biological Morphological Techniques

In biological morphological from and size options area unit extracted. Form choices like, major axis, areas, minor axis, ratio, breadth area unit utilized for discovery of plant. Covered up choices are found with the help of biological morphological strategy. Inside the technique the excessive inexperienced colour rule for segmentation of soil and vegetation utilized, hence median filtering for expelling the noise, morphological options and calculation of connected math threshold price.

1.2 Plant Reflectance Based Technique

Spectral coefficient technique is utilized for plant species identification. Spectroscope is vital to record spectral coefficient parameter however cost is beyond the common former will offered. various forms of spectral coefficient parameter is utilized like for vegetation indices, to live crop properties inside the spectrum generally ratios of broadband coefficient values are utilized. The alternatives like, variance of the close to spectrum, skewness, average gives the high level of success in color segmentation.

1.3 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.

1.4 Inter Plant Weed Detection

This paper, show a review of advancements in picture captioning research. In light of the procedures checked on, we will characterize image captioning approaches into different classifications. Agent strategies in each class are sketched out, and their qualities and confinements are discussed. To begin with examine techniques utilized in early work or conventional strategies which are basically retrieval and template based processes. At that point, we center around neural network based techniques. Neural network based methods can additionally classified into subcategories dependent on the specific methodology they utilize. Each subcategory of neural network based techniques are explained in detail. After that the techniques are compared on benchmark data set.

2. 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 proposed project to detect the weed in the crop by using image processing. Then we will give the inputs of the weed areas to an automatic spray pesticide only in those areas. This Algorithm prepares an image for further advanced processing and is consists of Loading the image from source, color segmentation, and edge detection. Color segmentation is the method used to separate the crop (which also include weed) from the background. The method helps in separating all the visually distinguishable colors from one another. In an image, an edge is a curve that follows a path of rapid change in image intensity. Edges are often associated with the boundaries of objects in a scene. Edge detection is used to identify the edges in an image. The operations like color segmentation, edge detection make the image ready for the next operation called filtering. The filter here is used for recognizing regions in which edges appear with a frequency in a specific range (weed frequency range).
In [2] "A computer vision application to detect unwanted weed in early stage crops" application for computer vision to detect unnecessary weed in crops from one area with extra agricultural[7,8] 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[3] The weed detection tool incorporates the use of machine-learning procedure explicitly implementing Support Vector Machines (SVMs) and blob analysis for the effective classification of crop and weed. Weed revealing is based on characteristic features i.e. red green blue (RGB) components which differentiate soil and plant. Morphological features centroid and length aid to distinguish shape of crop and weed leaves. Following feature extraction, the positive and negative margins are separated by a hyperplane. The separating hyperplane acts as the decision surface. Sample input consists of multiple digital field images of carrot crops. Training samples of seventy two images are taken.

In [4] 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.

3. METHODS

Methods for weed detection using image processing as follows:

3.1 Image Acquisition

Images of weed are taken from online dataset or from crop field utilizing high resolution camera for more precision in RGB format. Each gotten image is put away in particular size and in jpg format.

3.2 Preprocessing

Preprocessing is a common name for operations with images at the least level of abstraction both input and yield are concentrated images. The point of preprocessing is an enhancement of the image data that smothers undesirable distortions or improves some image features critical for assist processing. Gotten images are influenced by the different factors such as noise, lighting varieties, poor resolution of an image and undesirable background. In preprocessing a few tools are utilized for RGB to Gray scale conversion, Gray scale images to binary image, filtering techniques are utilized to remove the noise and undesirable objects from background

3.3 Image Enhancement

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis. For example, you can remove noise, sharpen, or brighten an image, making it easier to identify key features.

Image enhancement algorithms include deblurring, filtering, and contrast methods [9]

3.4 Image Segmentation

Image segmentation could be a fundamental step in many areas of computer vision including object recognition, video surveillance, face recognition, fingerprint recognition etc. It gives extra information about the substance of an image by distinguishing edges and regions of similar color and texture. Al- though a to begin with step in high level computer vision tasks, there are many challenges to ideal image segmentation. Segmentation subdivides an object into its constituent regions or objects. The level of detail to which the subdivision is carried on depends on the issue being solved. That's the segmentation should halt when regions or objects of interest have been detected. Interactive image segmentation could be a way to extract frontal area objects in complex scenes using simple user interaction. The key to victory in interactive image segmentation is to preserve characteristics of the users interactive information and keep up global data effectively.

3.5 Feature Extraction

In image processing, feature extraction begins from an initial set of measured data and builds features aiming to be informative and non-redundant, encouraging the subsequent learning and generalization steps, and in a few cases driving to way better human elucidations. Feature extraction could be a dimensionality reduction process, where an starting set of raw variables is decreased to more reasonable groups (features) for processing, while still accurately and totally describing the initial data set. After preprocessing features are extricated for detecting the weed. Include extraction is process of defining a set of features, for the efficient representation of the information for analysis and classification. Diverse types of features are texture features such as entropy, energy, contrast etc., size shape and colour based features are to extract the features

3.6 Image Classification

Classification procedures are utilized to classify the weed. Include vectors are passed as input to the classifiers. In classification classifiers are trained, validated and tested utilizing images of diverse weed. Some classifiers are artificial neural network, SVM, Decision Tree, Discriminant Analysis and KNN.

4. DETAILED ANALYSIS OF METHODS

4.1 Artificial Neural Network

Artificial neural networks (ANNs) are motivated by natural neural networks, especially the central nervous systems of animals and are utilized to estimate or approximate capacities that can depend on a large number of inputs and are generally unknown. Neurons in an ANN are arranged into layers. The first layer interacts with the environment to get input and so it is known as input layer. The last layer interacts with the output to display the processed data so it is known as the output layer. Layers between the input and the output layer that don't have any interaction with the environment are known as hidden layers.

4.1 Support Vector Machine

Kernelized support vector machines (often just referred to as SVMs) that allows for more complex models which are not defined simply by hyperplanes in the input space. While there are support vector machines used for classification and regression. Support vector machines are supervised learning models with associated learning algorithms that analyze information and recognize patterns. The most objective of SVM classifier is to construct a decision surface that can separate two classes at a maximum distance. SVM classifier will create a best decision surface, which is decided by a small set of points inside the training dataset. support vector machines are very powerful models and perform very well on a variety of datasets. SVMs allow for very complex decision boundaries, even if the data has only a few features. SVMs work well on low-dimensional and high-dimensional data (i.e. few and many features), but don’t scale very well with the number of samples.

4.1 Discriminant Analysis

Discriminant analysis is regression based statistical technique used in determining which particular classification or an object belongs to on the basis of its

characteristics [5]. In [6], the main goal of discriminant analysis is to estimate the relationship between a single categorical dependent variable and a set of quantitative independent variables. Discriminant analysis is able to handle either two groups or multiple groups.

4.1 k-Nearest Neighbour

One example for an instance-based learning algorithm is the k-Nearest Neighbour (kNN) algorithm. It uses the k nearest neighbours to make the decision of class attribution directly from the training instances themselves. Usually, Euclidean distance is used as distance metric. The decision for attaching the sample in question to one of the several classes is based on the majority vote of its k nearest neighbours. An odd number should be chosen for k to allow for a definite majority vote.

4.1 Decision Tree

Decision tree learning is one of the foremost broadly utilized and practical methods for inductive inference. There are numerous algorithms for developing decision trees. We utilize the foremost well known one: i.e. C4.5 (Q UINLAN 1993). A decision tree can be seen as a data structure in form of a tree. Each interior node contains a decision criteria depending as it were on one feature. The features´ relevance for classification is determined by entropy reduction which describes the impurity of the samples. For the first split into two parts the feature with the highest relevance is utilized. After such a decision the next feature is determined, which splits the data ideally into two parts. Since always one feature is considered at a time, a boundary of axis parallel parts is formed. This is often recursively repeated on each derived subset. In the event that followed from root to a leaf node the decision tree corresponds to a rule based classifier. An advantage of decision tree classifiers is their basic structure, which allows for interpretation (most important features are near the root node) and visualization.

5. COMPARISION

Table 1 Comparison of models

Model	Advantage	Disadvantage
SVM	• Deliver unique solution • Very efficient than other methods • Avoid over fitting.	• The high algorithm complexity • Runs slowly
Decision Tree	• Requires little effort from users • Easy to interrupt and explain	• Splits are very sensitive to training data set • High classification error rate.
ANN	• Able to capture information contained in large amount of data. • Build incredibly complex model	• It takes long time to train. • It require careful Preprocessig of the data •
KNN	• Easy to understand • Fast	• Prediction can be slow if the dataset is very large. • Does not perform well on dataset with many features.
Discriminant analysis	• Reduced error rate.	• More difficult to interrupt

Table 1 shows comparison with reference to advantages and disadvantages.

6. CONCLUSION

Presence of weeds on soil since men begun developing. Each vegetation blessing inside the rural field that's undesirable is named as weed. Weeds compete with crop for sunshine, Space, Water and Nutrients inside the soil. Weeds area unit the preeminent thought little of edit bugs in tropical agriculture in spite of the fact that they cause most reduction/loss inside the yields of crops than elective bugs and maladies. Image analysis may be a great instrument for non-destructive analysis of rural objects, and has been wide utilized in agriculture. Improvement in digital image taking gadgets and code to work on pictures has contributed amid this. The foremost advantage of image analysis is its potential for non-destructive and objective analysis.

Utilizing the forms like segmentation, feature extraction and clustering can be utilized to examine images of the crops. There's a ought to select the foremost suitable methods to help decision-making. The image processing techniques have been utilized over a vast range of agricultural production settings. The accuracy of classification changes depending on the algorithms resolution of images and limitations of image acquisition.

REFERENCES

1. Ajinkya Paikekari, Vrushali Ghule, et al., "**Weed detection using image processing**" International Research Journal of Engineering and Technology (March 2016).
2. Batriz Nathlia, et al., "**A computer vision application to detect unwanted weed in early stage crop**s" WSEAS 2016.
3. Sadia Murawwat , Armish Qureshi , Saleha Ahmad , Yousaira Shahid , "**Weed Detection Using SVMs**",Engineering, Technology & Applied Science Research, 2018.
4. http://www.businessdictionary.com/definition/discri minant-analysis.html, Retrieved on 10th January, 2015.
5. Martin Weis , Till Rumpf , Roland Gerhards , Lutz Plümer ,"**Comparison of different classification algorithms for weed detection from images based on shape parameters"**.
6. Chaitali Dhaware , Mrs. K. H. Wanjale , "**Survey On Image Classification Methods In Image Processing"**, International Journal of Computer Science Trends and Technology (IJCS T) – Volume 4 Issue 3, May - Jun 2016 .
7. Jatin Choudhary , Sutapa Nayak , "**A Survey on Weed Detection Using Image Processing in Agriculture**", International Journal of Computer Sciences and Engineering, 2016.
8. 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.
9. Su Hnin Hlaing, Aung Soe Khaing, "**Weed And Crop Segmentation And Classification Using Area Thresholding"**, Volume-3, Issue-3, Page No (1-8) IJRET2014.