CNN BASED WEED DETECTION IN FARMING -A SMART APPROACH

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Abstract—In recent times, weed detection has become very foremost difficult issue in agricultural science. Early detection of those weeds is highly required to supply healthy yield of crops. The life of farmers is likely to be improved by the earliest detection of weed. The process of finding weeds by the farmers is normally dispensed employing a manual method of segmentation. So, diagnosing via image process and deep learning is taken into account one in every of the foremost important issue of computer science systems. In this project we have a theory of proposing a deep learning approach to notice whether associate degree imaging of a filed contains a weed or not.

Keywords— Weed Detection, Segmentation, Image processing, Deep Learning, Feature Extraction.

I. INTRODUCTION

Weeds have a very common occurrence in lawns. Especially, it is majorly found in Agricultural fields with crops. Earlier the detection was done by employing some men. They will detect the weed by checking each and every place of the field. Then they will pluck them out manually using their hands. Later with the advancement in the technology they started using the herbicides to remove the weeds. But to detect the weeds they are still using manual power in many parts of the world. Later there came few methods to detect the weeds automatically but due to lack of their accuracy, they are unable to reach to the people. Then they started using image processing for this purpose. In this proposed project our main aim is to detect the weed in the crop by using image processing.

II. LITERATURE SURVEY

In [1] literature, various approaches and systems have been proposed to classify crops and weeds. The authors tried to address this problem by histogram based on colour indices to discriminate between three classes: soil, soyabean and broadleaf(weeds).

The [2] feature representation was tested with two powerful classifiers namely Backpropagation Neural Network (BPNN) and Support Vector Machine (SVM). This approach achieved an overall accuracy of 96% and 95% respectively. Novel Models such as VGGNet, DetectNet, GoogLeNet achieved high accuracy at detecting weeds in Bermuda grass turfgrasses.

In [3] author “Crop detection by machine vision for weed management” weed could be detected by using machine vision 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 acquisitor Excessive green algorithm was developed to soil and further avoidable things from the image. Image enhancement techniques are used to eliminate Noise from the images, By using Labelling 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 easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it 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.

In [6] author proposed "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 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 agriproducts, for this reason these weeds would be identified earlier and removed. This document presents an efficient curvelet make over and patch level tamura texture feature extraction method for weedclassification. The relevance vector machine classification technique was developed for crop and weeds classification and weed partition. The results were compared support vector machine and with random forest classifier technique. The planned method outperforms all the other transform in conditions of correctness, specificity and sensitivity.

III. PROBLEM STATEMENT

The manual identification of weed from imaging pictures vary from people to people based on their experience, skill, due to lack of specific and correct quantitative measures to classify the imaging pictures. There requires a lot of field work and manual labour to complete the task. So, we tend to come back up with an automatic model to detect the weeds from the field images.

IV. PROPOSED SOLUTION

The Project proposes to spot the weed images from scanned agricultural images using CNN model and edge detection process. The segmentation refers to the process of partitioning a digital image into multiple segments. So here we come up with the system, where system will detect weeds from other given dataset images. Here we convert RGB image into Gray scale image. User has to select the image system which will process the image by applying image processing steps. We applied all these edge detection algorithms to detect weed from crops image. Here we proposed image segmentation process for accuracy. In this firstly we train the model with some of the crops with weed images which predict that weed is present or not. Based on the extracted features our model detects weeds in the agricultural field.

V. DATASET

All dataset pictures area unit grey scale and therefore the foreground of the images area unit set at the middle. Picture's area unit captured

from different views of the field; therefore, the scale and position of the weeds vary in numerous anglesof them build the imaging of the them easier and more reluctant. In practice, farmer is aware of the areas that might have more accuracy of weed growth and can help in capturing the image. Since the educational method in deep networks is similar to the human learning method, we have a tendency to determine to make the same scenario for the deep neural networks. The information set can be collected from varied sources like a file, database, sensor and different sources and a few free information sets from net can be used. Here we have collected total of 1300 broadleaf images, 3520 grass images, 3249 soil images and 7376 soybean plant images.

The Objectives are: -

1. To pre-processes the given weed image to enhance the image.
2. To segment the affected weed area part for accurate examination of field image.
3. To classify the image using CNN classifier algorithm to detect the weed among crop excluding soil grass and crop.

VI. METHODOLOGY

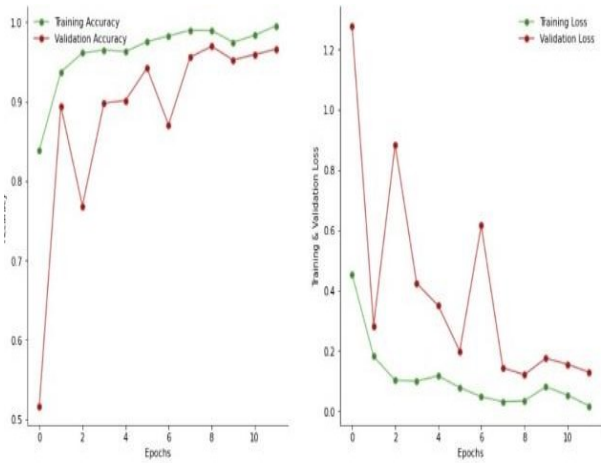
6.1. Image Pre-processing

Image pre-processing may be a vital side of any image-based application. This stage is needed for the following reasons: • It prepares the pictures for higher-level processing like segmentation and extraction. • It removes the marks or labels like name, date, within the image that may affect the classification task. • It increases the quality of image. • Removal of any varieties of noise within the image.

6.2. Colour Segmentation

Colour segmentation is the method used to separate the crop (which also include weed) from the background image into completely different regions and to extract the features. In specific, it's used for separating elements from the remainder of the image so they'll be determined or recognized as objects.

Types of Image Segmentation are: - a) Threshold Method. b) Edge Based Segmentation. c) Region Based Segmentation. d) Clustering Based Segmentation. e) Watershed Based Method. f) Artificial Neural Network Based Segmentation.



. Fig. 1Graph depicts the precision of prediction done using test analysis depicting sample line graph using colour which contrast well on screen.

6.3. Feature Extraction

When segmentation section is completed next step is to extract features from image which implies to extract the relevant information from image to check the effective results. The desired image after colour segmentation consists of green colour (the crop and the weed) and the remaining part of image black, making the image feasible to the step in the process, edge detection.

• 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.

• To detect edges properly we have to convert the colour segmented image into the Gray scale image.

• The image after both colour segmentation and edge detection is left with the edges and veins of both the crop and the weed in white and the remaining part completely Black.

6.4. Classification

Image classification plays a vital role and in various application domains like robot navigation in agricultural field, biometry, vehicle navigation, industrial inspection for visual purposes and remote sensing surveillance and videos. Mainly in our project images are mainly classified as soil, soybean, broad-leaf, grass.

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print(classification_report(y_test_new,pred))
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	precision	recall	f1-score	support
0	0.97	0.91	0.94	93
1	0.96	1.00	0.98	51
2	0.92	0.95	0.93	96
3	0.98	0.98	0.98	87
accuracy			0.95	327
macro avg	0.96	0.96	0.96	327
weighted avg	0.95	0.95	0.95	327

Fig. 3 Confusion Matrix

VII. CONCLUSION

This paper presents a model 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 algorithm's resolution of images and limitations of image acquisition.

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