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A Survey Paper on Weed Detection

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Abstract- Weeds are basically the plants that are not sown at a particular place, they grow naturally but they are unwanted. Weeds compete with the crops for water, minerals, light, space which eventually leads to reduction in yield of crops. So, it is important to manage and monitor them. The main objective is to develop a weed detection system based on Convolutional Neural Network (CNN) so minimum spraying of pesticides can be done on the areas of weed and maximum spraying of pesticides can be done on areas of crops. In this paper CNN technique is reviewed. In CNN models, the input image passes through series of convolution layers which has filters i.e. Kernels and apply ReLU activation to the matrix. Then pooling is performed to reduce the dimensional size and flattened output is fed into a fully connected layer (FC layer). Finally the output is classified as weed.

Keywords- Weed detection, Crops, Convolutional Neural Network (CNN), Image Processing, Machine Learning.

I. INTRODUCTION

WEED, a basic term used to describe undesirable plants/crops developed at an inappropriate location which hinders and interferes the growth of the other demanding crops.

They are of severe issue as they challenge the other wanted vegetation which in turn shrinks their quality and the quantity of their production as well. They need to be eradicated at the initial stage itself which subsides the production loss.

Secondly for the process of eradication of weeds, the orthodox method of implementing pesticides needs to be redeemed by the Deep Learning oriented model, which directs the user to identify the weed, its location and quantity of pesticide needed to be sprayed. In short it enables E farming but maximum accuracy, appropriacy and suitability.

The orthodox method involved physical labour, where each and every plant needed to be analyzed, recognized which now can be done implementing Deep learning model for detecting weeds, hence saving manual efforts, cost, quantity of pesticides as well. This technique for the weed detection is the most ultimate solution for efficient reduction or removal of chemicals in crop production.

Thus aiming to detect the weed and identify it in crops by using image processing algorithms and deep learning technique, a video of the agricultural area is given as a input to the system and hence weed detection with maximum accuracy will be processed. Image processing algorithms will be applied and the end result will give the identified and classified weed

II. LITERATURE SURVEY

For Image Processing and machine learning based classification of weeds and crops, there are several proposed methodologies.

XIAOJUN JIN [1] proposed that the precision achieved by the trained CenterNet model during the field test is 95.6%. Here vegetables were detected and bounding boxes were drawn around it and the objects which are not bounded by boxes were considered as weeds. Basically the first step performed here was image acquisition.

Here images of Chinese white cabbage were acquired for experimental purposes. Then Image Augmentation methodology was used on the collected images to fix color, brightness, rotation and 1150 images were expanded to 11500.Manual annotation was applied by drawing bounding boxes on vegetables which were used to train the CenterNet model.Then model was trained and tested to acquire desired result. According the experimental results it was proposed that this methodology is feasible for weed identification in plantation of vegetables.

Parallel image processing technique for weed detection can achieve precision of 91.1% as proposed by **Umamaheswari S [4].** The PWDS methodology is implemented using the Convolutional Neural Networks. The precision values of plant classification and weed detection were compared with the values proposed by S. Haug, J. Ostermann, and R. Bosch the paper A Crop /Weed Field Image Data set for the Evaluation of Computer Vision Based Precision Agriculture Tasks and the PWDS model has more accuracy. The use of neural network makes it more efficient because only pixels of input image are used by the system as neurons.

Use of hyper spectral data collection followed by label generation and classification is a method proposed by **Xiuping Jia[6]** where hyper spectral imaging system was used to gather images used for study which included Hyme, Alli, Azol, and Hyac. Then using data augmentation the number of images was increased by 2000 for each weed category.The CNN model consisted of 2FC layers. The configuration of architecture included convolutional layer, non linearity layer and max pooling layer. The recognization rate for 500 x 500 pixels patch size is 21.83%, for 250 x 250 is 24.43% and for 125 × 125 is 21.57% So it was proposed that 250 x 250 patch size achieves high recognization rate.

III. MOTIVATION

First and foremost the most crucial aim is to recognize and multiply the use on areas consisting of weeds. That specific area has to undergo further more operations for eradication of weeds for reusing it. Also efficiency, accuracy, suitability in real time applications has to be taken into consideration. Many weed detection projects are implemented with high accuracy but on image level. Image or the data set of images is processed based on which classification is performed, but here these come into picture- suitability and efficiency.

No doubt images do enable good accuracy lack the feasibility level. Stacking of images (video) is much more covninient, suitable than a single image. Considering the surface area, capturing and processing the images of every single plant in not feasible. Whereas one video can do the same in one go with best ac-curated results. Thus there exists motivation in all these factors

IV. PROPOSED SYSTEM

The proposed model detects the weeds from the crops. In this model some machine learning algorithms will be used along with several image processing techniques. The very first step will be acquiring the images of the field. This can be done manually or attaching a camera behind the tractor so that the real time images of the crops can be obtained.

1. Conversion of video (input) into frames:
The system doesn't understand the video as input, so we need to convert the video into number of frames(images). We need a folder to store the converted frames from the video, otherwise it creates its own folder and stores the frames. The frame creation will start from 0 value until the last frame. For conversion of the video to frame, you can either give a static video or live video.

2. Converting the image into Grayscale image:
After acquiring the images from the fields, we load the captured image of acquisition unit and do pre-processing on it. The RGB image is converted into Grayscale image. For many applications of image processing, color information doesn't help us identify important edges or other features. To save your precious time and make your life easy you can use grayscale images instead of using RGB. However, this is not true for every case. Some images might be better off getting processed with colors. But for the proposed system we convert the images into grayscale images. Then we find out the threshold image. Thresholding produces a binary image, where all pixels with intensities above (or below) a threshold value are turned on, while all other pixels are turned off. The binary images produced by thresholding are held in 2-Dimensional NumPy arrays, since they have only one-color value channel. They are Boolean; hence they contain the values 0 and 1.

3. Classification:
[9] Used CNN for the classification of weed. Neural networks are designed after our brains. They consist of layers of artificial neurons called nodes. Each node in a layer is defined by its weight values. When you give image as input data, it takes the pixel values and takes out the unique visual effects. When images are given, CNN will detect the edges of the picture, and then the definition of the image will get passed to the next layer. In the next layer, corner and color groups will be detected. After this, the definition of the image will be carried forward to the next layer and until a precision is made the cycle carries on. The main role of CNN in our model is to reduce the images into a form that is easier to process, for a good prediction.

After this, non-linearity of the images is increased by RELU. The images are naturally non-linear, so RELU is done. After RELU, pooling layer is carried out, which is another building block of CNN. The spatial size of our representation is reduced, so that the network complexity and computational cost is lowered. After this, flattening is done so that it creates a single long feature vector. This feature is used for the final classification.

V. CONCLUSION

Weed detection is one of the most promising and emerging technique in the back lands which can help develop the traditional agricultural activity exclusively. With emerging technologies and abstract implementations, the agricultural activists can ace the crop cultivation and production.

Since one of the three living necessities depends on this pursuit, it can be considered as a non extinct one with huge future scope applications. Thus manual work is now being reconstituted by the leading edge mechanization.

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