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Weed Detection Using Machine Learning

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Abstract - *Due to the variable plant spacing in vegetable plantations, weed identification is more difficult in vegetable than weed identification in crops. There has been minimal research on weed identification in vegetable plantations so far. In the numerous focuses on traditional crop weed identification approaches have mostly focused on detecting weeds directly. Nevertheless, weed species vary greatly. In contrast, this research provides a new method that blends Machine learning and video/ image processing technologies. The first step was to use a trained center Net model to detect veggies and create bounding boxes around them. The remaining green objects that fell out of the boundary boxes were then labeled as weeds. As a result, the structure concentrates solely on detecting vegetables, avoiding the handling of numerous weed species.*

Key Words: **Deep Learning, Image Processing, Weed Detection, Machine Learning, YOLO 3**

1.INTRODUCTION

Modern agriculture is becoming more reliant on computer-based systems. Various technical advances have opened new possibilities to gather information and use it in agriculture as well as in other subjects. Agriculture may not have traditionally been the first to implement the latest discoveries in technology, however, precision agriculture with localization such as Global Positioning System (GPS) and other information technologies are becoming everyday tools for farmers. Automated machines are starting to take over tedious tasks formerly performed only by humans.

In the new era Economic and ecological benefits are the driving forces to implement new methods into agriculture to increase production. Balancing efficient farming and preservation of nature has traditionally been difficult.

2. MOTIVATION

The technique used for increasing result to identify and reuse weed affected area for more seeding to increase production. In the agricultural field weed had detected by its properties such as its Size, Shape, Spectral Reflectance, Texture features and gives the result crop/weed. In this document they have demonstrated weed detection by its Size features as well as video processing.

3. LITERATURE REVIEW

XIAOJUN JIN 1 , JUN CHE2 , AND YONG CHEN1 [1]" Weed Identification Using Deep Learning and Image Processing in

Vegetable Plantation", Due to the variable plant spacing in vegetable plantations as well as crop, weed identification is more difficult than weed identification in crops. There has been minimal research on weed identification in vegetable plantations thus far. Traditional crop weed identification approaches have mostly focused on detecting weeds directly through traditional methods; nevertheless, weed species vary greatly. In contrast, this research provides a new method that blends machine learning and image processing technologies. The first step was to use a trained Center Net model to detect veggies and create bounding boxes around them. The remaining green objects that fell out of the boundary boxes were then labeled as weeds. As a result, the structure concentrates solely on detecting vegetables and weed. Furthermore, by reducing the amount of the training image data set and the complexity of weed detection, this technique can improve the weed identification performance and accuracy. A colour index-based segmentation was used in image processing to extract weeds from the backdrop. Genetic Algorithms (GAs) were used to determine and assess the colour index used, which was based on Bayesian classification error. The trained Center Net model had a precision of 95.6 percent, a recall of 95.0 percent, and an F1 score of 0.953 during the field test.

Pignatti S, Casa R.2 , Harfouche A.2 , Huang W. 3 , Palombo A. " Maize Crop And Weeds Species Detection By Using Uav perpectral Data",[2] In order to use precision agriculture techniques like patch spraying, it's necessary to monitor and map weeds within agricultural crops. Both environmentally and economically, precision and targeted weed eradication would be beneficial. When high spatial and spectral resolution data (i.e., from UAV platforms) is available, VNIR hyper spectral data can be a strong tool for performing effective weed monitoring and identification. This study investigates the spectral differences between crops and weeds in order to assess the potential of UAV hyper spectral data to distinguish maize crops from weeds and different types of weeds. During the 2016 growing season in Italy, UAV and field hyper spectral data were collected in a few corn fields. The results demonstrated that leaf chlorophyll and carotenoid content, extracted using spectral indices or inverting PROSAIL, may be used to

distinguish between maize crops and weeds, as well as between weed species. The approach allowed for the measurement of crop/weed relative ground cover, which demonstrated a strong correlation with the obtained relative LAI values.

A. J. Ir´ıas Tejeda1 F," Algorithm of Weed Detection in Crops by Computational Vision", [3] The use of precision agriculture tools for weed management in crops was the subject of this study. Its focus has been on developing an image-processing system to detect the presence of weeds in a specific agricultural site. The main goal was to find a formula that could be used to create a weed detection system using binary classifications. The first step in image processing is to detect green plants in order to remove all of the soil from the image and reduce unnecessary data. Then, using different medium and morphological filters, and it focused on the vegetation, segmenting and removing unwanted data. Finally, the image has been labeled with items such that weed detection may be done using a threshold depending on the detection area. This algorithm establishes accurate weed monitoring and can be used in automated systems for weed eradication in crops, either through the use of specific-site automated sprayers or a weed cutting mechanism. Furthermore, it improves the efficiency of crop management operational operations by reducing the time spent searching for weeds across a plot of land and concentrating weed removal tasks on specific places for effective control.

Om Tiwari ," An experimental set up for utilizing convolutional neural network in automated weed detection ", [4] : One of the variables that contribute to a decline in agricultural yield is the presence of weeds in the crops. Weeds take up nutrients and water, causing the plant to lose weight and reduce the number of grains per ear and grain output. So, using new drone technology and deep learning in the field of convolutional neural networks, a way must be devised to detect these weeds in the field and then spray herbicide on them to completely eliminate them. The authors used a data set from the Indian Agriculture Research Institute (IARI) fields to apply a transfer learning technique to identify three weeds.

Umamaheswari S," Weed Detection in Farm Crops using Parallel Image Processing", [5] Pesticides and fertilizers used in agriculture are utilized to educate the human community about environmental issues. Agriculture producers must meet an ever-increasing demand for food. Precision agriculture based on IoT has evolved to address environmental challenges and food security. Precision agriculture enhances production and quality while lowering costs and waste. Based on the collected photographs of the farm, we present a system to recognize and locate weed plants among the farmed agricultural crops. We also propose employing parallel processing on the GPU to improve the performance of the above system so that it may be used in real-time. The suggested method uses a real-time image of a farm as an input to determine the kind and position of weeds in the image. The proposed work uses photos of crops and weeds to train the system using a deep learning architecture that incorporates feature extraction and classification. The findings can be employed by an automated weed detection system for precision agriculture operations.

YUHENG WANG, "image matching algorithm for weed control application in organic farming",[6] A weed control robot system in general consists of a weed classification and a weed destruction unit, both of which are physically separated from one another inside the robot, resulting in the weed distraction result. As a result, tracking of classified weed positions with a low-resolution VGA camera and a developed matching algorithm is an important step for weed destruction in organic farming with a robot system. In this paper, tracking is done with a low-resolution VGA camera and a developed matching algorithm. Because the robot's position can shift owing to a stone or other obstruction in its path, tracking is required. Also, modifications in the robot's pace resulted in weed destruction. Simulation and experimental results are used to summarize the performance of the picture matching technique.

Wei-Che Liang, "Low-Cost Weed Identification System Using Drones", [7] Weeds compete with crops for resources like sunshine, nutrients, water, and space. Weeds can develop dozens to hundreds of thousands of seeds that can survive for a long period, posing a serious threat to crops once they reach maturity. The easiest strategy to eliminate weed risks is to remove weeds before they blossom, which reduces the likelihood of weed seeds dropping into the soil. The majority of existing drone-based weed identification technologies rely on extra equipment to improve their accuracy. Drones power consumption and efficiency and load burden rise as a result of such solutions, in addition to raising their cost. In this paper, researcher propose a low cost Weed Identification System (WIS) that uses RGB photos captured by drones as training data and builds the identification model using Convolutional Neural Networks (CNN) model which gives results in terms of weed/crop. The WIS results can be used as a reference for agriculture researchers, as well as to alert farmers about the activities that need to be undertaken. The WIS can accurately identify weeds up to 98.8

Adnan Farooq, Jiankun Hu, Xiuping Jia, "Weed Classification In Hyper spectral Remote Sensing Images Via Deep Convolutional Neural Network ",[8] : In order to reduce the expense of farming and the impact of herbicides on human health, automatic weed detection and mapping are essential for site-specific weed control. In this paper, we use hyper spectral images to examine patch-based weed identification. For this aim, the Convolutional Neural Network (CNN) is evaluated and compared to the Histogram of Oriented Gradients (HoG). Patch sizes that are appropriate are studied.

Syed I. Moazzam, "A Review of Application of Deep Learning for Weeds and Crops Classification in Agriculture" ,[9] Weeds are a major reason why farmers have a poor crop harvest. To identify weeds in crops, many algorithms have been developed. In the past, color based, threshold-based, and learning-based techniques were used. Deep-learning based techniques stand out among all the techniques because they produce the best results. The application of deep learning-based approaches for weed detection in agricultural crops is discussed in this research. The presence of weeds in sunflower, carrot, soybean, sugar beet, and maize is investigated. Deep learning structures and parameters are discussed, as well as research gaps that need to be filled.

4. PROBLEM STATEMENTS

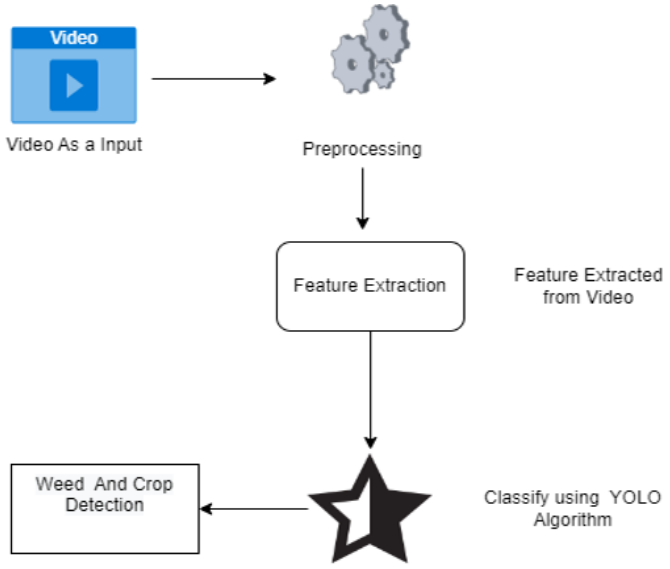
Weed detection is the problem of accurately identifying the area of weeds so that specific areas can be targeted for spraying with minimum spraying on the other plants of interest.

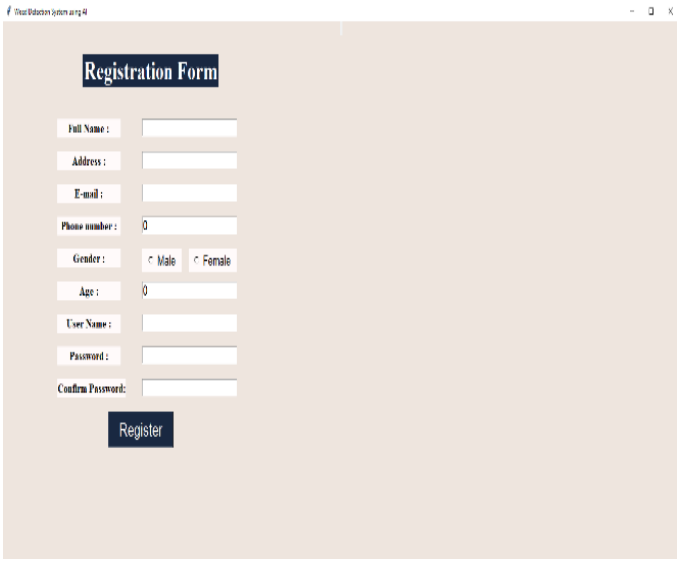
5. ALGORITHM

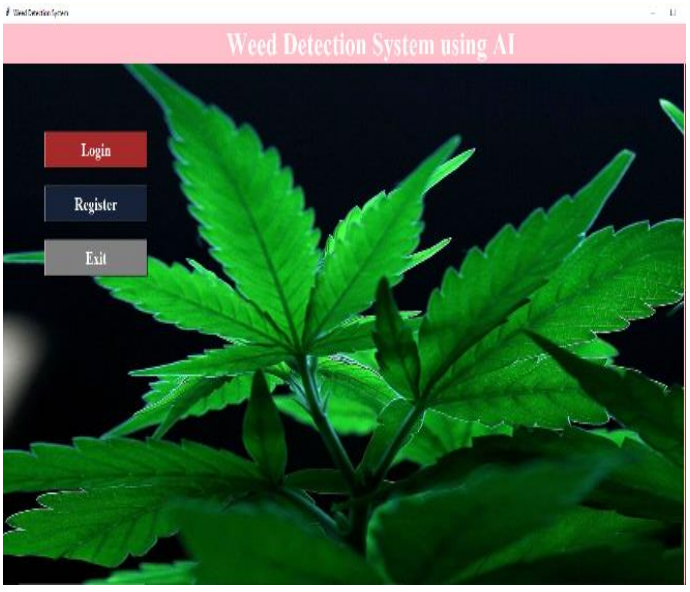
The YOLO v3 detector in this situation is based totally on Squeeze net, and makes useof the characteristic extraction community in Squeeze internet with the addition of detection heads at the end. The second detection head is twice the size of the first detection head, so it is better able to detect small objects. In this technique you can specify any number of detection heads of different sizes based on the structure and size of the objects that you want to detect. The YOLO v3 detector makes use of anchor boxes on video and photographs anticipated using training data to have better preliminary priors similar to the form of data set and to assist the detector discover ways to predict the boxes as it should be. For information about anchor boxes, see Anchor Boxes for Object Detection.

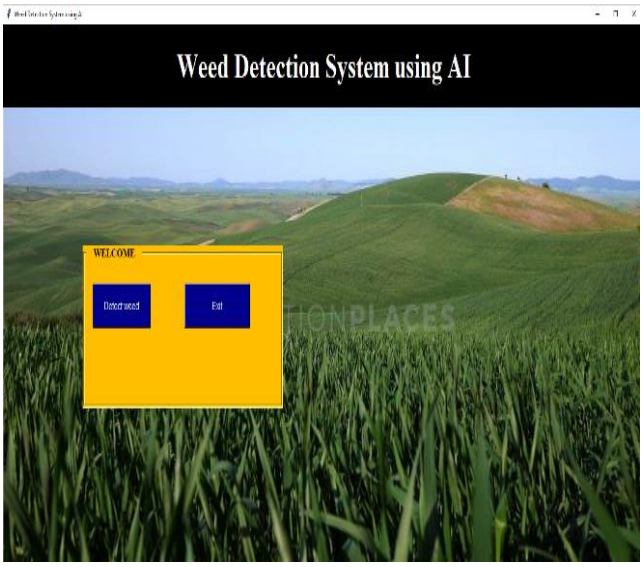
6. SYSTEM ARCHITECTURE

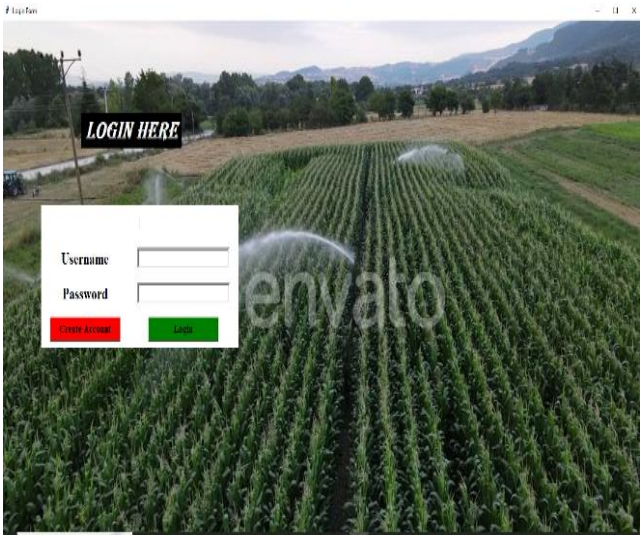
System architecture is the conceptual model that defines the structure, behavior, an architecture description is a formal description and representation of a system, organized in a way that supports and reasoning about the structures and behaviors of the system as shown. A gadget structure can consist of machine components and the sub-systems advanced, on the way to work together to put into effect the overall system. There had been efforts to formalize languages to explain machine structure; collectively those are called architecture description languages.

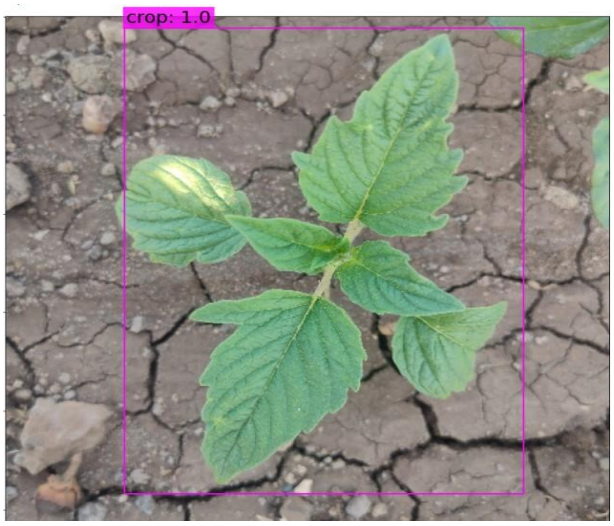












7. CONCLUSION

We proposed an approach to identify weeds in vegetable plantation using deep learning and image processing. The algorithm was depicted in two steps. A YOLO v3 algorithm was trained to detect vegetables. Then the remaining green objects in the color image were considered as weeds. To extract weeds from the background In this way, the model focuses on identifying only the vegetables and thus avoid handling various weed species.

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