

DEEP LEARNING BASED ACUMEN CROP SCRUTINIZING AND WEED HOEING AGRO DEVICE

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ABSTRACT

All the people in the world depend on agriculture for food. While using man power farmers are facing difficulties like less availability of labor and high labor cost. The farmers are looking for new technologies to overcome these difficulties. At present there are some devices for picking weeds in the field but they are not in practical use. This agro device uses evolving technology i.e. deep learning. Deep learning is a class of machine learning algorithm which uses multiple layers to extract high features from the raw input. In deep learning, convolution Neural Network is most commonly applied to analyze visual imaginary. CNN takes input and assign importance to various objects in the image and be able to differentiate one from another. By using deep neural network the device is able to classify the crops accurately and autonomously. The weed hoeing arm is connected to the micro controller for hoeing the weeds. In addition, a novel navigation strategy is proposed to guide the device to move around. The farmer can operate the device with the help of android phone.

KEYWORDS: deep learning; Convolution Neural Network; micro controller; IoT.

I. INTRODUCTION

In these days, the farmers are expected to produce more yields with high quality at lower expenses that is they want to be less dependent on labor forces. The application of robots has become wide spread because they are used as a substitute for human workers to perform high degree and hazardous works. There are number of autonomous robots developed in agricultural, medical, military and industrial field over the past decades. Unwanted plants i.e. weeds acts as a barrier for the growth of main crops. Weeds will degrade the crop if it is not removed within the short span of time hence the repetitive removal of weed produce the high yield. Weedicide can't be a perfect method for the removal of weed. Weed picking by manual method is a tedious and repetitive task and automated robots can be potential candidate for this application. But the robot for weed hoeing in agricultural field is still a challenging task because the classification of crops and weeds is difficult given that the crops and weeds have similar colors, shapes and texture. On the other hand, people's care on their health is increasing as they are demanding natural products to maintain their good health. Hence the products should be chemical fertilizer free as much as possible. When we use weedicide for removing weeds, the main crops will also get affected. Therefore we have devise a weed hoeing system aimed at less consumption of manual labor.

II. RELATED WORK

1) Recognition of Agricultural objects by shape

This detector was invented in the year 1983 by Grossan. This is primarily designed to distinguish the agricultural objects. The agricultural products can be recognized by an convolutional calculations. The image is classified on the basis of image noise, object size, x-ray imaging and object orientation. The x-ray image of the product is obtained in desktop computer having the vector graphic screen. The screen area is divided into 32*32 matrix and representing the pixel intensity of the image.

2) Fruit defect detection from color images using ACM and MFCM algorithms

The image segmentation plays a major role in image processing applications. This paper is studied about the quality of the fruit. The automatic algorithm is used to determine the skin color defect of fruit. In the preprocessing stage the background of the fruit is removed for extracting the fruit shape. By using the active contour model algorithm (ACM) the background of the image is eliminated and the segmentation of the obtained image is done by using the modified FCM algorithm. In the fruit detection the defect of the fruit is detected.

3) Fruit size detecting and grading system based on Image processing

In order to increase the quality and the production of the fruit there is a necessity for the invention of the automatic detection technology. Weather report of the hardware and the software technology, the detection of fruit becomes easier by using image processing method. This system is using Arm 9 as the main processor and it develops the size detection program by image processing algorithm. The capturing of the image is done by using the CMOS camera. The whole background of the image is set black to extract the size of the fruit with more accuracy. Image processing algorithm is done for detection, the diameter of the fruit. The preprocessor is containing the image filter. The detection is the key factor for identifying the size of fruit. The grading of fruit is done by considering the diameter of image.

III. SYSTEM ARCHITECTURE

AS SHOWN IN FIG.1, THE COMPLETE SYSTEM OF THIS DEVICE INCLUDES: (1) ARDUINO MICRO CONTROLLER (2) DC MOTOR (3) CAMERA (4) IOT (5) RELAY.

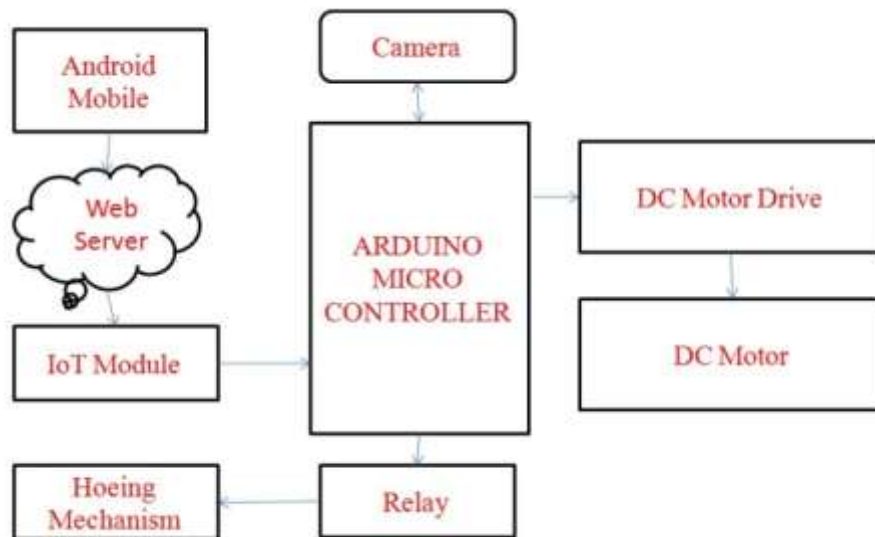


Fig-1: The hardware module of the robot

A. Arduino micro controller

Arduino is an open-source electronics platform. It is based on easy-to-use hardware and software. Arduino boards can be able to read inputs such as light on a sensor, a finger on a button and turn it into an output like activating a motor, turning on an LED.



Fig-2: Arduino micro controller

B. DC Motor

A DC motor is a class of rotatory electrical motors that converts electrical energy into mechanical energy by rotation.



Fig-3: DC Motor

C. Camera

A camera is an optical instrument which is used to record images. At their basic level, cameras are sealed boxes (the camera body) with a small hole (the aperture) that let light in to capture an image on a light-sensitive surface (usually photographic film or a digital sensor).

D. Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals.



Fig-4: Relay

E. IoT

The internet of things or IoT is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

IV. PROPOSED SYSTEM

The proposed system is for hoeing the weeds in the field. The module consists of six wheeled rover and above which it is an embedded module. The web camera is fit on the module which is used to capture the image of the field when the robot moves. The captured image of the plant is send to the matlab software. In this software, we are using deep learning as a backend tool. In the software we have already stored the content of the healthy crop image. The loaded image can be taken in the internet or it can be captured using the camera. In matlab the comparison takes place between the already loaded crop image and the detected plant. If the image of the plant captured by the robot in the field matches with the stored image, then it is a crop. If it is not matched with the plant means it is a weed. The matlab produces output in terms of codes. It assigns code 0 for the crop and code 1 for the weed. The code is then sending to the Arduino microcontroller. The Arduino turn the code into function. If weed is identified means, the micro controller sends the command to the arm to pick the weeds. The arm is connected with the 5v dc motor with the help of relay. We are using Blynk application in the smart phone to control the hardware remotely. It is done via the web server. The web server is software where the content is stored. The IoT is the network of inter connected things. With the help of this the server content is send to the micro controller for the movement of robot.

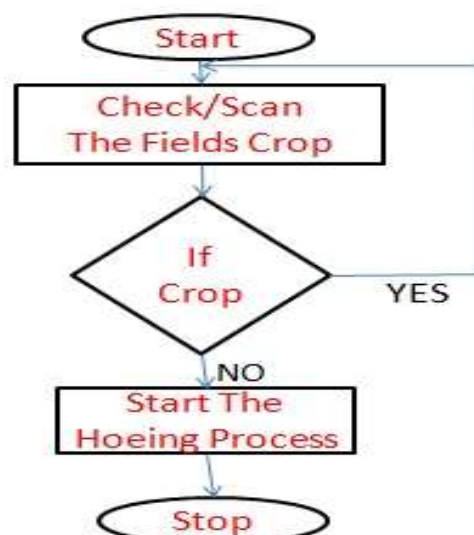


Fig-5: Flow chart

V. DESIGN CONSIDERATIONS

In agricultural fields a heavy weighted vehicle can't run with the less amount of power supply due to uneven structure of land hence we have developed a lighter and rigid vehicle which can sustain in that environment.



Fig-6: Side View of the Device

The robotic arm is given movement command through the IoT which is then repeated until the next reset is done. The repetitive movement cycle is used to remove the weed in fields where there are column-wise plantations where there is a lot of unwanted weed growing in between the plant columns. We can interrupt the operation at any time to stop the repeated operation if any malfunction occurred.

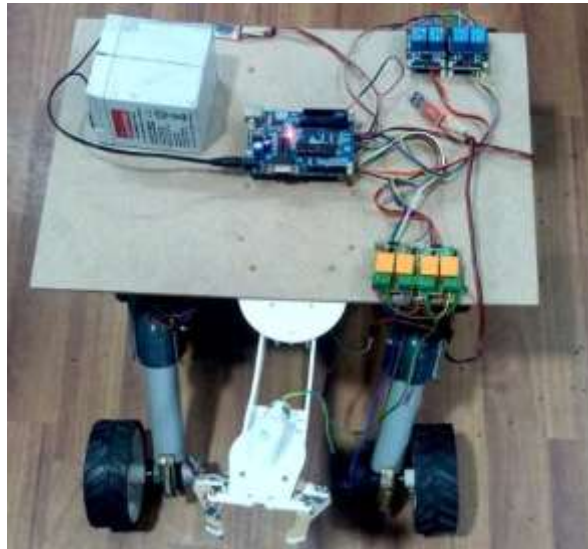


Fig-7: Top View of the Device

VI. CONCLUSION

The agricultural weeding robot was built and tested under normal external field like conditions for demonstration. The working of the arm is repetitive and so the rover moves and removes the weed in the field. The device designed is designed to remove the weeds from the ploughed land automatically in an easy manner i.e. no manpower required. The project consists of two setups the first one consist of a Rover which will move in crop lines and another one is an Arm those are controlled by two efficient methods. This proposed paper mainly aims to improve the yield of the agricultural products and to minimize the cost and time of operation. In developing countries, the robotics field growing very faster since every process requires to be automated. So this proposed system can be one of the efficient systems in the field of Agriculture. The main problem was in autonomous weeding robots is it fails to distinguish the weeds with the main crops so here we have proposed a

human trained and controlling the robot to avoid malfunction operations. So this robot will give Sufficient outcome for which the system has developed.

VII. REFERENCES

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