WEED DETECTION USING RASPBERRY PI BASED ON IMAGE PROCESSING

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***Abstract*: Agriculture, although known as the backbone of the Indian economy, is facing crisis in terms ofproduction. One of the major issues in the agriculture sector is the growth of weeds among thecrops. The weeds are removed by three ways, that isby tilling method, by manual labour and finally by weedicides. Weeds are removed by above three methods which consumes more time and amount. Weed is detected and removed by using raspberry pibased on image processing. The weed image is captured using web camera which is interface with raspberry pi, the captured image signal is stored andthat signal is given to raspberry pi and finally imageprocessing algorithm takes place. The identified weed is captured and it removed by spraying chemical.**

***Keywords*: Agriculture, Crop, Image Processing, Raspberry Pi, Weed Detection, Weed Removal**

I. INTRODUCTION

Weeds are the unnecessary plants growing among a set of cultivated crops that compete with the desiredplants for resources like light, water, space and nutrients. The weeds may take up the essentials supplied for crop growth. Such a situation can cause considerable decline or delay in the yield. Hence there is a requirement to inhibit the weed growth as much as possible. Also, the growth rates of the weedsare likely to be higher thanthe crops. This is becausethe weed's root or seed is already present in the soil waiting for the ambient growth conditions to shoot up. This calls for repeated and periodic weed removal. This is a time consuming and labor- intensive task when manually performed. An automated weed removal system is a solution.

The identification and removal of weeds are performed through image processing [5]. The systemfocuses on reducing human labour as well as the timerequired to identify and remove the weeds without adversely affecting the crop. The weed management system performs k-nearest neighbour algorithm fromthe field. Image processing is then performed in the Raspberry Pi board using virtual network computing viewer which is a library of pre-written functions. K-nearest neighbour algorithm for weed detection is developed. Based on the results, the activation of the weed removal mechanism is controlled. The entire system is set up on a moving robot.

II. OBJECTIVE

The main objective of this project is to build a systemwhich detects weeds using image processing [5]. Theautomatic weed detection and smart herbicide sprayer
[4] robot developed in uses an image processing algorithm to process the images captured by the raspberry pi camera at regular intervals and upon identifying the weeds, an arrangement is made to spray the herbicide directly and only on the weeds.

III. LITERATURE SURVEY

[1] Ajinkya Paikekari The automatic weed detection and smart herbicide sprayer robot developed in uses an image processing algorithm to process the images captured by the Raspberry Pi Camera at regular intervals and upon identifying the weeds, an arrangement is made to spray the herbicidedirectly and only on the weeds. The algorithm mainlyuses an K-Nearest algorithm approach to detect weeds. Once the weeds are identified, a signal is sentfrom Raspberry Pi to the motor driver IC controllingthe waterpump motors to spray the chemicals over the weeds.

[2] Amir H. He developed a weed detection and classification method that can be applied for autonomous weed control robots. The plants are classified into crops and weedsby a machine vision algorithm. Image acquisition is done by any types of digital cameras such as normal webcams. The acquired images are processed in the LabVIEW environmentto find locations of weeds in the image. Finally, herbicides are Sprayed on desired spots.

[3] Aravind R, Daman M. He developed field imagecaptured is processed by theRaspberry Pi board. The image passes through various stages of processing. Initially, image pre-processing is performed to suppress unwanted distortions and to enhance some image features important for further processing.

[4] Ali M. Shirzadifar. The other option is to use textural information of weeds and crops. He was among the first who used texture features as a discrimination factor in weed detection and achievedclassification accuracy ranging from 30 to 77% for different species. In addition, system response time ofthe algorithm was about 20 to 30 seconds whichwas asignificant drawback. Polder et al. and Ahmad also exploited textural features of weedspecies in order toclassify them.

IV. IMPLEMENTATION

The Raspberry Pi is a series of credit card–sized single-board computers developed in England, United Kingdom by the Raspberry Pi Foundationwith the intent to promote the teaching of basic computer science in schools and developing countries. The original Raspberry Pi and Raspberry Pi3 are manufactured in several board configurations through licensed manufacturing agreements with Newark element14(Premier Farnell), Components and Ego man. The hardware is the same across all manufacturers.

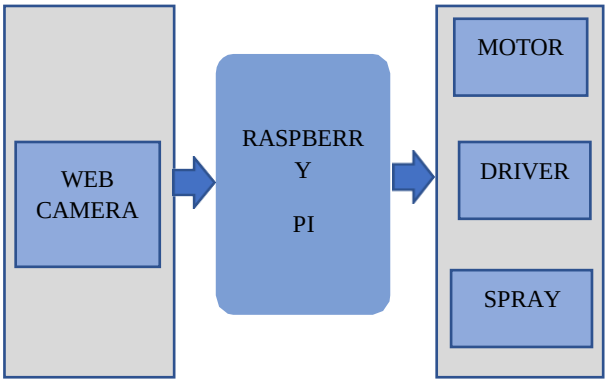


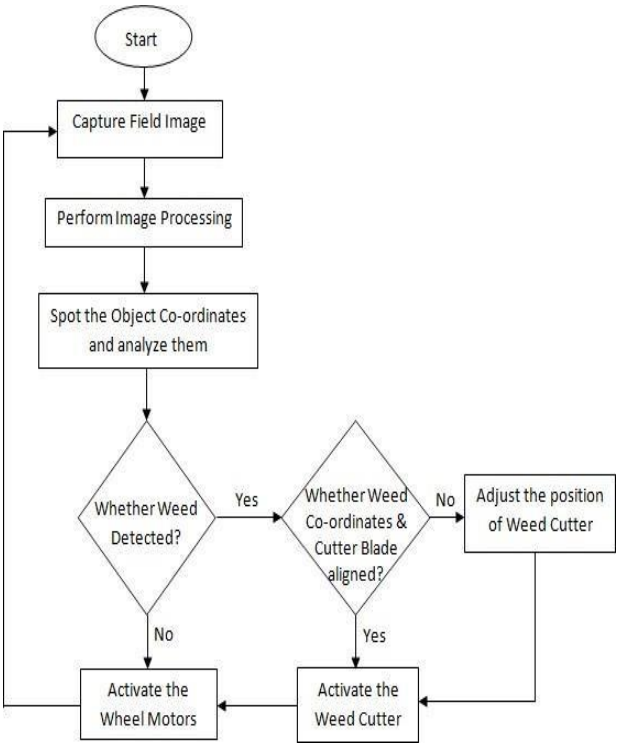
Fig 1: Block Diagram

The camera consists of a small (25mm by 20mm by 9mm) circuit board, which connects to the RaspberryPi's Camera Serial Interface (CSI) bus connector via a flexible ribbon cable. The camera's image sensor has a native resolution of five megapixels and has a fixed focus lens. The software for the camera supportsfull resolution still images up to 2592x1944 and videoresolutions of 1080p30, 720p60 and 640x480p60/90.A display monitor is an electronic device used to display video output from computers.

Work Flow

Weed detection and removal are based on imageprocessing. The field image is captured and processedby the Raspberry Pi.

The K-nearest neighbour algorithm is performed in the proposed system. The system matches with capture image to predefine image. In this ,If weeds arenot detected, the robot moves forward and captures the next image. If weeds are detected in the image their coordinates are checked to find if the weeds are in the centre and aligned with the position of the weedcutting blade. The robot moves till the coordinates getaligned. Once it gets aligned, taking the weed cutter to the weed's location and then the weed cutter is activated.



V. RESULT

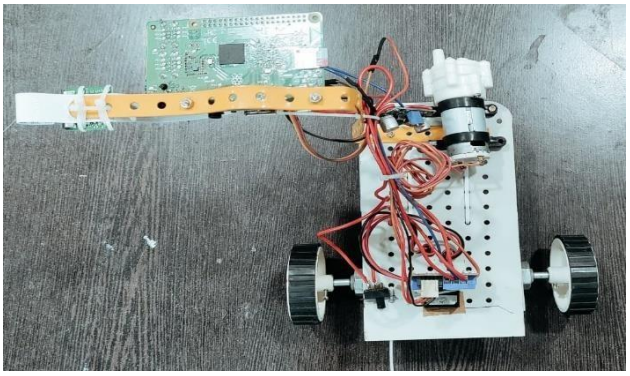


Fig 2: Front View of Protocol Type

Our system is concerned with the weed detection using raspberry pi based on image processing machine with an interactive user interface for weed detection.

Fig 3: Weed

Fig 4: Crop

CONCLUSION

The work present system using image processingalgorithm for weed detected images are processed bythe proposed algorithm (k-nearest algorithm). The algorithms gave reliable results through image to detect the presence or absence of weed cover. An algorithm based on k-nearest neighbor and is designed for weed detection.

FUTURE SCOPE

The image analysis for weed detection can be furtherimproved by dividing the image into more number ofregions and have as many nozzles to spray the chemicals. It can be turned into a very robust closed loop system by incorporation a memory module. Theimage processing algorithm can be developed furtherso that the detection become more generic.

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