Development of Agribot System for Weed Detection and Automatic Spraying of Herbicide

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Abstract: *Agriculture plays an important role in Indian economy. Technology helps in increasing the production of food. However the production of food can be affected by number of factor such as climatic change, diseases, soil fertility etc. Weeds have the potential to result in 33 percent of crop loss. Economic loss of about USD 11 billion was estimated to weeds alone in 10 major crops of India. Weeds increases the cost of agriculture and hinders the progress of work and damages crops by affecting their growth. Weed control is an important aspect of crop management, as failure to adequately control weeds it leads to reduce yields and product quality. Automatic detection of Weed proves benefits in monitoring large fields of crops. The proposed work consists of modules namely Weed detection module to detect the weed and automate the agribot to spray the herbicides, Soil moisture detection module to automate the water supply based on soil moisture, Robot movement module to control the agribot movements based on the presence of weeds. Tools and technologies used to implement the proposed work are arduino IDE, python IDLE, Embedded C. YoloV5 is a framework where CNN algorithm is used in it. The outcome of the proposed project is to help the farmers through an agribot which detects the weeds in the field by image processing and sprays the herbicide to prevent the damages for crops. Water supply is automated based on soil moisture. It will be very useful to increase the production of food and also reduces the man power.*

Keywords: Agribot system, Weed Detection, Automatic Spray, Herbicide

1. Introduction

Agriculture is the practice of growing plants for food, fiber, and other desirable items. Agriculture has been chosen as the primary occupation by more than 42% of the total population in the world. Since more than 70% of Indian population depends on agriculture, it is called as the 'Backbone of India'.

According to recent studies it has been found that farmers still follow traditional methods to carryout agricultural activities because of which labor force is increased and accuracy of the final outcome is decreased. This project aims to solve agriculture related issues and increase accuracy of the final outcome by developing an agricultural robot which does agricultural tasks automatically such as irrigation along with detection of weed and spraying of herbicide.

The main aim of Agribot is to apply robotic technologies in the field of agriculture. Automation in agriculture is being developed to implement number of agricultural activities without any man force.

The project aims to build a weed detection module and indicates the agribot to spray herbicide. The purpose of this project is to reduce the farmer's work load as well as increase the speed of work along with increase in yield of agriculture.

Agriculture is changing economy of the country day by day. Improper management of crops results in loss of agricultural products. The proposed prototype indicate that weeds can be detected in less computational time.

2. Literature Survey

S. No	Author and Paper Title	Details of Publication	Summary of the Paper
1	**Authors:** Prakash, P., et al. **Title of Paper:** "Precision agriculture using agribot for the welfare of farmers."	Asian J Appl Sci Technol 2.2 (2018): 730-736.	It is designed to minimize the labor of farmers in addition to increasing the speed and accuracy of the work.
2	**Authors:** Gowrishankar, V., and K. Venkatachalam. **Title of Paper:** "IoT based precision agriculture using Agribot."	Global Research and Development Journal for Engineering 3.5 (2018): 2455-5703.	Due to increase in labor shortage interest has grown for the development of the autonomous vehicles like robots in the agriculture.
3	**Authors:** Wang, Aichen, Wen Zhang, and Xinhua Wei **Title of Paper:** "A review on weed detection using ground-based machine vision and image processing techniques."	Computers and electronics in agriculture 158 (2019): 226-240.	The paper focuses difficulty of weed detection lies in discriminating between crops.

3. Implementation

Since the project's goal is to construct a weed identification system, this goal will be accomplished by developing a programme that can distinguish between crops and weeds using image processing methods and machine learning. This project is both technical it develops and puts into practice a system to distinguish between crops and weeds using the technologies at hand and research it examines the

body of knowledge and applications already in existence in this area of study. This kind of initiative, according to Oates (2006), adds to the body of knowledge by integrating a novel technique into Agribot's operations. To develop this kind of project, the methodology explained in this chapter is followed.

The project mainly consists of 3 modules:

1) Detection of weed in the field
2) Automate spraying of herbicide to the weed
3) Automate water supply to dry soil

The Block diagram of the project describes the flow of data. The below figure shows Block of the system. It is a well- defined and well-specified software application architecture that organizes applications into logical and physical computing.
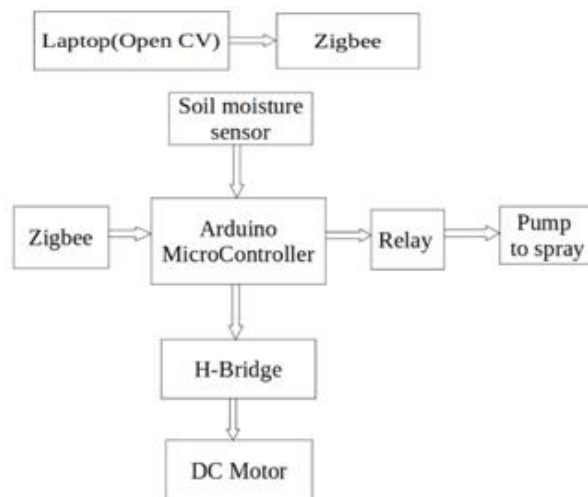

Figure 1: Block Diagram

4. Analysis of Weed Detection Agribot

1) **Weed detection:** Capture or Input a weed image and analyse the place of the weed. Then it sends the place of the weed where it has detected front, left or right to the agribot through zigbee.
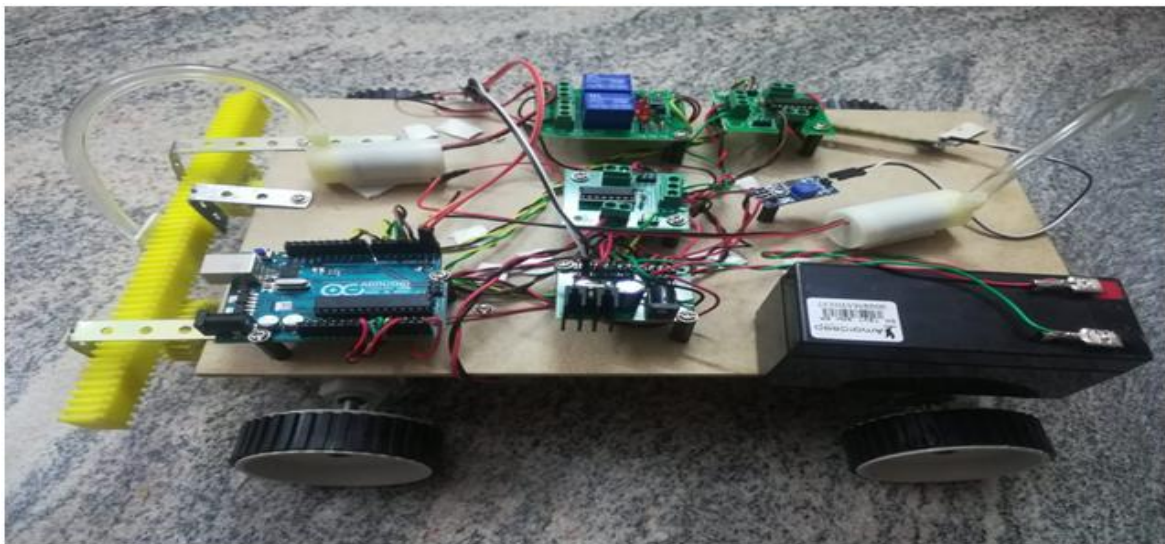

Figure 2: Front weed detected

Figure 3: Right side weed detected

Figure 4: Left side weed detected

2) **Agribot :** Agricultural bot to spray the herbicide to the weed and supply water to the dry soil.

Figure 5: Agribot to spray herbicide and supply water

5. Result and Conclusion

This project is for developing agribot model to detect the weed and automate the herbicide spray to the weed. For developing a systematic approach has been taken into account. The extreme Programming method of the waterfall model has been applied to develop the system. The application has been developed using a Python and Embedded C.

The project successfully implemented a working complex prototype in agriculture field. The implemented prototype software has been fully tested to demonstrate the quality and performance of the system. This report also documented all the relevant research details. In summary, the project has satisfied its objectives and fulfilled its purpose. I hope, the application can meet most of the requirements of weed detection accurately and spray herbicide and also supply water to dry soil.

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