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Automatic Farming Robot for Smart and Effective Cultivation

JayaPriya S, G R Anagha, K R Megha, Harshitha B S

(1JB17IS031,1JB17IS019,1JB17IS032,1JB17IS026)

Dept. of ISE, SJB Institute Of Technology

Abstract— The paper aims on the design and development of robot that is used in the field of agriculture. The robot helps the farmer to perform soil levelling, seed sowing, water and pesticide sprinkling, soil levelling and cutting the crop. It is mainly designed to minimize the labour of farmers in addition to increasing the speed and accuracy of the work. We are using an android application to provide the input to the robot. By using Bluetooth, we are establishing a connection between the robot and the application. As per the user instructions the robot will perform the operations.

Keywords— Robot, Application, Bluetooth.

I. INTRODUCTION

Indian agriculture has begun in early days by 9000 BCE because of early cultivation of plants, and domestication of crops and animals. Agriculture is the one of the most important careers in India. It serves to be the spine of Indian economy. Today, India ranks 2d global in farm output. Our record of agriculture includes many examples of using tools, along with the hoe and the plough. Some of the major issues in the Indian agricultural are cost expensive, availability of professional labours, lack of water resources and crop monitoring. To triumph over these issues, the different automation technologies have been utilized in agriculture. The automation within the agriculture would assist farmers to reduce their efforts. In this the robotic is evolved to pay attention in a green way and carry out the operations appropriately. The proposed concept implements the vehicle to carry out the different functions along with ploughing, seed sowing, water sprinkling, soil levelling and slicing the crop. These functions can be integrated into a single robot and then performed. The robot is connected to the mobile device using Bluetooth and controlled via the application present the device. The application consists of gesture/shadow mode to move the robot: forward, backward, right, and left along with the buttons with the different operations of a robot such as ploughing, seed sowing, water and pesticide sprinkling, soil levelling and cutting the crop.

II. LITERATURE SURVEY

[1] Shreyash Kulkarni AgriBot is a robot designed for agricultural purposes. This Bot can perform basic elementary functions like ploughing, sowing, watering, fertilizing, pesticides and closing the dig. It also provides manual as well as auto control. The main component here is the Arduino that supervises the entire process. Seeding is one of the first steps in farming. During this process seeding is carried out in all the rows of the farming plot. In irrigation process, slowly applies small amount of water to the planted seeds in all the rows of the farming plot. The fertilization process is same as irrigation process, but some crops need fertilizers when the seed germinates, and the plant begins to grow.

[2] Sunitha. M has carried out seeding robotics for the irrigation system. Some of the major problems in the Indian agricultural are rising of input costs, accessibility of skilled labours, lack of water resources and crop monitoring. To overcome these problems, the automation technologies with robots were used in agriculture. The automation in the agriculture could help farmers to reduce their efforts.

[3] M. Priyadarshini has found on the robot which performs operation like soil, moisture testing, seeding, spraying pesticides, removes compost from the field, which also performs obstacles avoidance operation and metal detection in the path. The robot is controlled using cell phone using DTMF technique. Because of using DTMF technique it overcomes the range or distance problem of using Bluetooth or RF module which having limited working range. Agribot integrated system which uses Wi-Fi to communicate between two robots which perform activities like seeding, weeding, spraying of fertilizers and insecticides. It is controlled using Arduino Atmega2560 controller and powerful Raspberry pi minicomputer to control and monitor working of robot. It has hexapod body which can move in any direction as per required. It has ultrasonic proximity sensor to avoid the obstacles in the path, and underbody sensor system to detect that seed is planted or not. It can dig a hole in soil plant seed in it and cover the hole again with soil and necessary pre-emergence fertilizers applies on it and move on along with communicating with another robot near to it using Wi-Fi.

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Command based self-guided digging and seed sowing rover, a sensor guided rover for digging, precise seed positioning and sowing has been proposed to reduce the human effort and also to increase the yield.

[4] Ankit Singh was focused on rover's navigation is performed by remote guiding devices fortified with the positioning system. It uses Arduino Atmega2560 controller and ultrasonic radar sensor for obstacle avoidance. It is controlled using wireless module that can be control by PC/TAB/Mobile. It gives acknowledgement massage of seed tank empty or full to the farmer. The agribot which perform only two operations like digging hole in field that is ploughing in the field and then planting a seed at a regular interval and cover the plough area with soil. To drop the seed stepper motor is used and to dig a hole, spike wheel is used.

[5] N. Firthous Begum, gave the motivation of this research is to decrease harvesting cost and increase the productivity. Conventional harvesting method is highly labour intensive and inefficient in terms of both economy and time. Machine harvesting systems by robot are a partial solution to overcome these issues by removing fruits from the trees efficiently. Thus reduce the harvesting cost to about 35-45% of total production cost. An agribot is designed to reduce harvesting cost.

[6] Amrita Sneha. A, this paper strives to develop a robot capable of performing operations like automatic ploughing, seed dispensing, fruit picking and pesticide spraying. It also provides manual control when required and keeps tabs on the humidity with the help of humidity sensors. The main component here is the AVR at mega microcontroller that supervises the entire process. Initially the robot tills the entire field and proceeds to ploughing, simultaneously dispensing seeds side by side. The device used for navigation is an ultrasonic sensor which continuously sends data to the microcontroller. On the field the robot operates on automated mode, but outside the field is strictly operated in manual mode. For manual control, the robot uses the Bluetooth pairing app as control device and helps in the navigation of the robot outside the field.

III. METHODOLOGY

The basic aim of this paper is to develop a multipurpose robot, which is used for digging the soil, seed sowing, water spraying, leveller to close the mud and cutter to cut the crop. This whole system of the robot works with the power supply as shown in the figure. The base frame of the robot is made with 4 wheels. One end of the frame is fitted by dc motor (DC MOTOR 1,2) and design is used for robot movement. • The other end of the frame is fitted by a dc motor (DC MOTOR 3,4) and design is made for levelling and digging• The whole robot requires the 12v battery for operation. • Bluetooth receiver is used to control the operation of the vehicle.

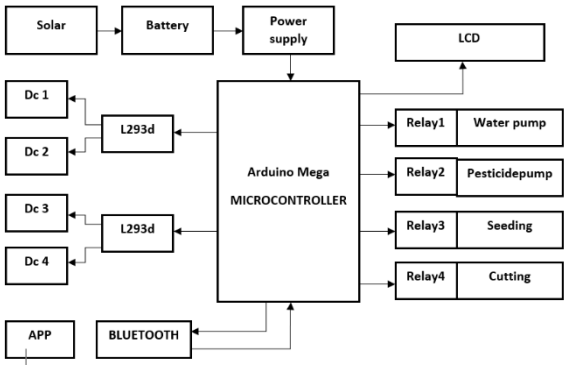

Figure 1: Architecture of proposed system

IV. EXPERIMENTAL RESULTS

In this section we will discuss about the results of our prototype. First, we will connect our robot with the Android Bluetooth Application with HC-05 configuration. Before that we need to open the login page of our application and need to give the password. Once the connection is established, we will move to the next page in application where we find the buttons for respective operations. We have four buttons for robot movement such as Front, Back, Left and Right. Once we perform these operations, we can stop the robot using Stop button. Then for soil levelling operation we have level up and level down buttons. Then there are two buttons for Pesticide and Water Pump which are used to water the plantations and to sprinkle the pesticides. Then we have a button Dig for digging operation and for seeding operation we have a button as Seed. Then to cut the crops, we have CON button for cutter on operation and COFF button to switch off the cutter. All the operations are tested, and our prototype works in the field of agriculture.

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Figure 2: Model of the Agriculture Robot

Figure 3: Login Page of Bluetooth app

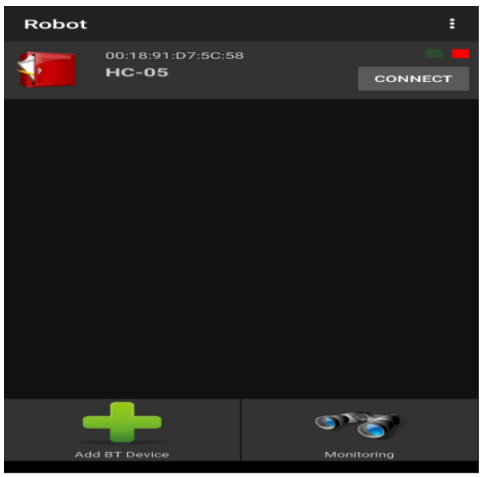

Figure 4: Bluetooth Connection

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Figure 5: Main Layout

V. APPLICATION

- The robots can protect the human workers from the harmful effects of handling the chemicals by the hand.
- Another application is it has efficient seed sowing at optimal depth and at optimal distances between crops and their rows, specific for each crop type when they are programmed.
- Robot moves through the field with a water tank that sprays water all over the field which eliminates the usage of large pipe setup and makes the operation easy.
- The robot works based on command given by the controller. Various parameters along the robotic path makes the leveling process easy.
- It makes the crop cutting process faster, efficient and saves time which makes the farmers to think about improvement of the quality of the crop.

VI. FUTURE WORK

Sensors as an extension to this initial prototype many sensors can be added to detect obstacles, to detect temperature and moisture content. Sensors to detect the depth of the land to appropriately sow seeds can be added. A camera can be installed on the Agriculture Robot and the application can be modified to display the field with a 360-degree view on app as robot moves. New technologies like Zigbee, WIFI, WI Smart can be used to have a large connectivity range. Automated disease prediction. The robot can be designed with chain roller instead of normal wheel.

VII. CONCLUSIONS

Agriculture has been a great source of national income. so, as to modernize the agriculture sector we can make use of machine called agriculture robot that automates the tasks for farmers by minimizing the industry's reliance on physical labor and increasing the efficiency of production. Our Multipurpose autonomous agricultural robot has successfully implemented and tested for various functions like soil levelling, seed sowing, cutting, pesticide and water spraying and digging. It is developed by integrating agricultural robot with Embedded C programming. Using relays for movement of the agricultural robot makes the system easy to move and handle. This also helps from the harmful effect of handling chemicals by the hand. Usage of conventional source of energy has been a prominent means of power supply. Thus, by the usage of the multipurpose robot in the agriculture field makes the productivity higher to the mark with less cost efficiency and also helps in modernizing agriculture sector with a remarkable result.

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