

A Review paper on Design and Implementation of Agriculture Robot

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ABSTRACT

The idea of applying robotic technology in agriculture is very innovative, the opportunities for robot enhanced productivity is vast. Our prototype agriculture robot performs agriculture operations like seed sowing, ploughing and water spraying. Here we are using a regulated DC power supply (12V) to power the Arduino and DC motors which are connected to the wheels of the robot also with the help of Bluetooth; we will connect all the instructions through our mobile phone. We believe that this low cost and portable multipurpose robot will help the farmers and reduce their labour costs.

Keywords: *Arduino, Bluetooth, Motor Driver, DC Motor, Agriculture.*

I. INTRODUCTION

The idea of using robots in agriculture field is very new. In modern India also near about 70 percent of people are reliant on agriculture. Several operations are performed in the agricultural field like seed sowing, grass cutting, ploughing, harvesting, water spraying, removing of weeds, spraying fertilizers or insecticides, protect the crops from birds and wild animals, etc.[8] The conventional methods of all agriculture operations like ploughing, seed sowing, and irrigation are very complicated. All the operations required different equipments and these equipments used are very heavy, expensive, inconvenient to handle and less efficient. As currently there is no particular equipment available which will do all their work together at a single time. So there is need of new techniques to be implemented in this field to ease the farmer's work. So the agricultural system in India should adapt a system which will reduce the man power and time and increase the accuracy. [8] This work aims to develop and design of the robot which can plough the field, sow the seeds and cover seeds with the soil and also the irrigation purposes all the operations at single time.

We will use a 12V DC Adapter to power the both Arduino and the motors. The plough and the mud levelling equipment is attached to the mechanical frame. While the 4 DC motors are used to operate the wheels of the robot. A 5V DC submersible pump is used to pump the water from water tank to the roots of the crop.

A separate 12V dc motor is used for the seed sowing function funnel is used to store the seeds and dispenser is attached at the bottom of it, the turbine is also attached to it. As the turbine rotates the seeds will distribute in the soil. The turbine will rotate in a slow manner and with the help of its blades only few seeds will be dispensed in the soil. With the help of Bluetooth we will give all the commands to the robot through our mobile phones. In this project we will make the robot share its electrical and mechanical power in efficient way.

The organization of this paper is as follows. Section II deals with literature survey which presents previously published research paper's and related works. Section III shows the common objective for the project. The proposed block diagram of multipurpose agricultural robot is presented in Section IV. The components which are proposed are given in section V. In section VI we talk about advantages and in section VII there is future scope. The conclusion of this paper is in section VIII.

II. LITERATURE SURVEY

The robotics field is progressively increasing its productivity in agriculture field. Some of the major problems in the Indian agriculture field are growing input expenses, availability of skilled labours, lack of water resources and crop monitoring. To conquer these problems, the automation technologies make a use of robots in agriculture. The automation technology in the agriculture can help farmers to reduce their efforts and hard work.

In [1] K Durga Sowjanya, R Sindhu, M Parijatham, K Srikanth, P Bhargav discusses on the look, design and model of the autonomous agriculture robot. The main motive is to decrease the labor force and provide efficient way for it. It implements the use of Microcontroller and Bluetooth technology and helps in digging the soil, seeding, leveling the soil and then water spraying over the soil. The paper highlights how the robot can be controlled using just a simple Android app. The advantages of such simple model is that it is compact, lightweight and economic for the farmers also.

In [2] Akhila Gollakota and M. B. Srinivas has termed the indigenous agriculture robot as “Agribot”. India is a major agriculture boosted economic country and so such machines are necessary for the farmers to work faster in the fields. The model consists of a PSoC controller to operate the components of the motor and it performs the functions like ploughing the soil, seedling and covering the soil over. The paper shows how PSoC controller can display over many parameters and is an alternative to the Arduino microcontroller. The advantage of this model is that it will improve the accuracy and efficiency of operations in the farms.

In [3] Saurabh Umkar and Anil Karwankar underline the effect of unavailability of skilled workers in the farming occupation and use of machinery is very vast. So it presents a design and development of a robot which will perform the functions of ploughing, seed sowing and also to detect obstacles in the way. The result of this model shows how the seeds are placed in the field at different intervals. The advantage of such model is that it increases productivity in the farm and also operates on a renewable energy source of solar power.

In [4] Shivaprasad B S, Ravishankara M N, B N Shoba has highlighted how the design and implementation of seed sowing and fertilizers take place. The model uses many sensors and apart from Arduino it also uses Raspberry Pi for communication purposes. The model can sense the moisture, pH level and humidity of soil and can provide fertilizer spraying accordingly. This will help the farmers in fertilizer spraying and will help them look over various parameters about soil.

In [5] Swati D.Sambare, S.S.Belsare has described over the whole process of seed sowing technology. The dispensing mechanism uses ARM module and is connected to PC using Zig Bee module. The paper explains how various seeds can be dispensed and sowed through the robot accordingly. This can help the farmers in seed sowing purpose in the fields.

Also many other research papers helped us to understand the different aspects highlighted by the research on the agricultural robot. Robot's basic terminology, its function and use, all the process were written and experimented in this research paper. We have developed the system on paper to help us to make this robot successful in operation. Three mechanisms are implemented in the designing of the robot. This work also throws light on the future scope of robots.

III. OBJECTIVES

- The objective of this review paper is to research over the multipurpose agriculture robots designed and implemented using various methods, which is used for digging the soil, sowing the seeds and spraying the water with least changes in accessories with minimum cost.
- Also to provide an efficient and automated purpose in the field and to help in increasing productivity and reducing labor for the farmers.

IV. PROPOSED BLOCK DIAGRAM

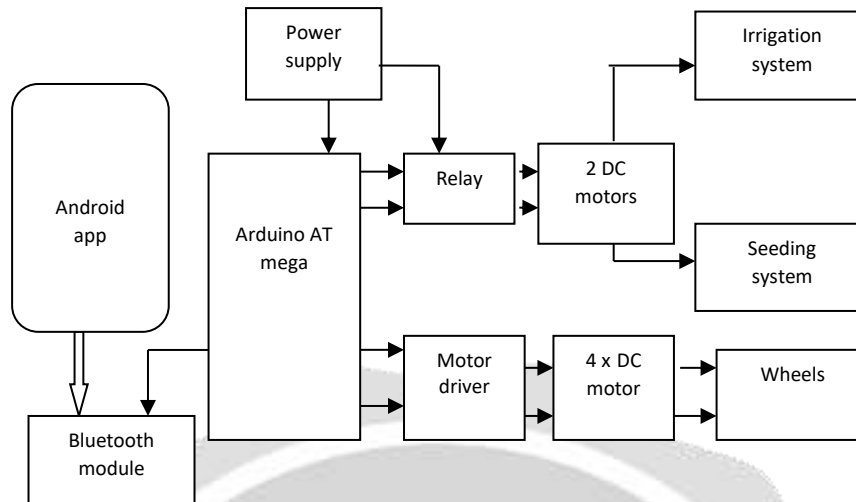


Fig – 1: Block Diagram of the Proposed System

This is the proposed block diagram of the robot. The brain of this robot is the Arduino AT mega microcontroller. [1] This microcontroller has the capacity to handle multiple inputs and outputs at the same time. A 12V regulated power supply is given to the microcontroller as shown in figure above. The Bluetooth module is connected to the Arduino which acts as the signal and data receiver and transmitter for the person. This module can be used to connect the robot to the mobile phones using the Bluetooth app in smartphones.

The additional regulated power supply is given to the 4 motors through motor driver circuit for the movement of the robot in the fields. And later a double channel relay is connected to the Arduino and further the relays are connected to 1 of the motor for seeding purpose and the later one for irrigation.

V. PROPOSED SYSTEM COMPONENTS

Arduino Mega:

In this proposed robot we are going to use the Arduino Mega 2560. Arduino Mega 2560 is a microcontroller board based on ATmega2560 having 54 digital input and output pins, 16 analog inputs, 4 UARTs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller. This microcontroller is programmed using Arduino software called IDE (integrated development environment). Arduino Mega 2560 is similar to Arduino UNO but Arduino Mega comes with more GPIO pins and memory space, also its size is bigger as compare to Arduino UNO. Two voltage regulators are integrated on the board through which you can adjust the voltage according to your need. To turn it on simply just connect it to a computer with a USB cable or power it with an AC to DC adapter or battery.

Bluetooth Module:

To communicate with the robot with our mobile phone here we are going to use HC-05 Bluetooth module. HC-05 Bluetooth module is designed for wireless communication. Bluetooth serial modules permit all serially enabled devices to communicate with each other using Bluetooth. It has 6 pins: KEY/EN, VCC, GND, TXD, RXD and STATE. This module works on 3.3 V DC. We can connect 5V supply voltage also as the module has on board 5 to 3.3 V regulators. To communicate mobile phone with HC-05 Bluetooth module, mobile phone should have Bluetooth terminal application for transmit and receive the data. You can locate Bluetooth terminal application for android and windows in respective application store.

LM298N Motor Driver:

This circuit act as an interface between the microcontroller and motor. An external DC supply is connected to the motor driver circuit to supply required voltage and current for the operation motor. The motor driver circuit we used is L298N. The L298N Based Motor Driver circuit is a high power motor driver circuit perfect for driving DC Motors. It has the on board 5V regulator which it can supply to an external circuit. It can control up to 4 DC motors, or 2 DC motors with directional and speed control.

VI. ADVANTAGES

1. This research paper will help to develop agriculture robots to make the agriculture work easier to be done in large fields.
2. The proposed model can be controlled through a wide range and helpful in any seasons instead of solar types which don't work during cloudy weather.
3. The model proposed can improve the accuracy and precision of the agriculture operation on a great extent.
4. The model can also be built economical as respect to the costs of each different equipment use for each different application is conquer as the proposed model can do all the application without using lots of heavy equipments.

VII. FUTURE SCOPES

1. As too much of sensors and things can make the system bulky and heavy, with further studies the model can be made lighter in weight.
2. Due to unbalanced level of field, the robot may find difficulty to operate straight for which the model can be made adjustable based on springs and level controller in future.
3. For longer ranges Wi-Fi DMPT technique can also be used.
4. In upcoming future the robot can be made fully automatic i.e. the robot will not require any operator.

VIII. CONCLUSION

From the reference papers we reviewed we conclude that the agriculture robot is capable to perform various agriculture operations in the field but we observed that it require some improvisation. So in this paper a robot named, multipurpose agriculture robot is proposed to carry out different agriculture operation like plugging, seed sowing, mud leveling and water spraying. The proposed outcome shows that this robot is implemented to work as planned and also an economic solution to the farmers. It is expected that this robot will help the farmers to improve the efficiency and accuracy of agricultural operations. [2]

IX. ACKNOWLEDGEMENT

The authors would like to thank the Head of Department and professors of Department of Electrical Engineering for their valuable guidance and encouragement.

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