IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 09, Issue 4 (April. 2019), ||S (III) || PP 32-37

Multipurpose Agribot

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Abstract: AgriBot is a robot designed for agricultural purposes. As one of the trends of development on automation and intelligence of agricultural machinery in the 21st century, all kinds of agricultural robots have been researched and developed to implement a number of agricultural productions in many countries. This Bot can perform basic elementary functions like ploughing, sowing, watering, fertilizing, pesticides and closing the dig. This robot capable of performing operations like automatic seeding, irrigation, fertilization. It also provides manual as well as auto control. The main component here is the Arduino that supervises the entire process. At the present time, robots are increasingly being integrated into working tasks to replace humans specially to perform repetitive task. 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.

Key Words: AgriBot, Ploughing, Seeding, Watering, Fertilizing, Arduino, Pesticides.

Date of Submission: 12-04-2019 Date of acceptance: 27-04-2019

I. INTRODUCTION

Agriculture was the key development in the rise of human civilization. A remarkable change in agricultural practices has occurred over the past century in response to new technologies, and the development of the world agricultural markets. This also has led to technological improvements in agricultural techniques. Robotics is the branch of technology that deals with the design, construction, operation and application of robots, as well as computer systems for their control, sensory feedback and information processing. The design of a given rover will often incorporate agricultural efforts, though it may not look much like a human being or function in a human like manner. These types of intelligent systems having robust and feasible model with a number of integrated functionalities is the demand of future in every field of technology, for the betterment of the society. Precision farming has been hailed as the agriculture, sustainability and the food industry. That's why this system is working to bring precision agriculture technology to environmentally conscious individuals for the first time. Agriculture is an expensive and wildly wasteful industry. The precision farming movement may not solve every problem the industry faces, but it does have a lot of potential to improve sustainability and efficiency. Before this, precision agriculture equipment was only available in the form of massive heavy machinery.

This system is programmed to plant and grow a variety of vegetables simultaneously in the same area as the bot able to take care of each plant in its own way. The system works on a RF module with a seeding mechanism and spraying mechanism on the chassis to dig and sow the seeds and spray water, fertilizers and pesticides. The main area of application of robots in agriculture industry today is at the harvesting stage. There are many benefits for the agricultural industry, including a higher quality of fresh produce, lower production costs and less need for manual labour.

Fig -1: Ploughing of field in for Ancienttimes.

Fig -2: Use of tractor Ploughing.

Farmers today spend a lot of money on machines that help them decrease labor and increase yield of crops but the profit and efficiency are little less. Hence automation is the ideal solution to overcome all the shortcomings by creating machines that perform the operations and automating it to increase the yield on a large scale. This will help the farmer to control the agricultural works from a far distance without going in the field with an easy control.

II. LITERATURESURVEY

In [1] the author describes a system which uses 24cc engine for digging operation and for spraying used a moto with 12V battery. Next two operations are manual base which is cultivation and sowing. this machine performs four farming operation (digging, sowing, spraying, cultivation) which is used in small scale farming.

In [2] the author gives an overview of the proposed system. The prototype of an autonomous Agriculture Robot is presented which is specifically designed for seed sowing task only. It is a four wheeled vehicle controlled by LPC2148 microcontroller. Its working is based on the precision agriculture which enables efficient seed sowing at sowing at optimal depth and at optimal distances between crops and their row, specific for each crop type.

[3] is a paper in which the author has proposed a system that aims at designing multipurpose autonomous agricultural robotic vehicle which can be controlled through Bluetooth for ploughing, seeding and irrigation systems. This is especially important for the workers in the area of potentially harmful for the safety and health of the workers. These robots are used to reduce human intervention, ensuring proper irrigation and efficient utilization of resources. These robots are mainly useful in automated weed control; usage of fertilizers based on soil condition, soil sensors for drip irrigation in rain feed areas.

III. PROBLEMSTATEMENT

In today's farming system the requirement of man power is more. Also, the resources such as water and pesticides get used more by manual farming and hence there can be wastage of resources. there can be the health issues due to the chemical properties of pesticides and fertilizers.

1. Skilled Man power is required to do work in agriculture sector.
2. Problem in getting and retaining labour to do agriculture work.
3. Farmers death due to the hazardous pesticides.
4. Excess Time consuming to perform individual process.
5. Cost is relatively very high in traditional farming system.
6. Water gets wasted, which is very useful in drought prone areas and can hamper the storage.
7. In [2] the proposed system uses a robotic arm to pick up seeds and dig in deep into the soil which is time consuming and requires a powerful battery.

IV. Objectives

1. Apparatus to plough the field, seeding, fertilizing and mechanical arms for closing the dugpits.
2. Special spraying mechanism for spraying water and pesticides is also mounted on the chassis which will reduce farmersdeath.

3. To Increase the work speed and reduce in manpower/labour.
4. To reduce the labour cost and time required for multiple operations of farmingsystem.

V. WORKING

The project involves 60% hardware and 40% software. Arduino(UNO)actsasabrainofthehardwarecircuit,which receives the data from the transmitter remote control and helps in performing seeding, watering,fertilizing.

5.1 Procedure Adopted

The receiver section of the robot consists of an Arduino UNO, RF Receiver, HT-12D Decoder IC, L293D Motor Driver IC and a robot chassis with four motors connected to wheels and 2 more are connected for the seeding and water pouring mechanism. HT-12D is the decoder IC that is often associated with RF Receiver. It converts the serial data received by the RF link into parallel data.

L293D motor driver IC is used to provide the necessary current (for both forward and reverse directions) to the motors. Pins 1 and 9 are the enable pins and are connected to VCC (+5v) along with Pin 16 (which is the logic supply).

The Arduino forms the brain of the machine and controls all the operations like seeding, watering, fertilizing, driving of motor drivers. Arduino is programmed in such a way that when it receives the decoded message from the receiver, it gives the given command from the remote-control buttons to the respective motor drivers. There are motor drivers for wheels, seeding and spraying mechanism. The seeding and pouring mechanisms are on when the robot is turned on using the Z button (center green). There are two special keys given on the remote control which controls the motor drivers of the seeding tray and water pouring mechanism. When the X button (right green) is pressed the seeding mechanism will be started and when the Y button (right red) is pressed the seeding will be stopped. The same function is applied on the left side with green for starting the watering/fertilizing function and red for stopping the watering function.

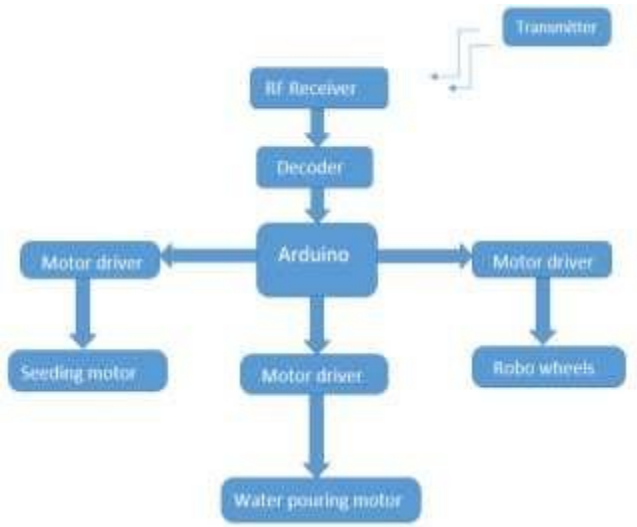

Fig-3: Block Diagram of Agribot Receiver.

The transmitter section of the robot consists of HT-12E Encoder IC, RF Transmitter and DC battery of 5V. HT-12E is an encoder IC that is often associated with RF Transmitter module. It converts the 12-bit parallel data to serial data. The 12-bit data is divided into address and data bits.

The movements of the robot depend on the push buttons on the remote controller. The data through the push buttons will be encoded with the help of the encoder. The encoded data will be transferred to the transmitter and via antenna the code will be transmitted to the receiver side. The transmitted data is given to the main heart of the receiver section i.e. Arduino via the transmitter. The directions buttons are used to give the chassis direction when it reaches the end of the farm field and also for controlling the directions during the farming operations.

There are total 4 buttons (X, Y, A, B) for the on and off operation of the mechanisms and one extra button (Z) is given for the switch on and (W) to off the Agribot.

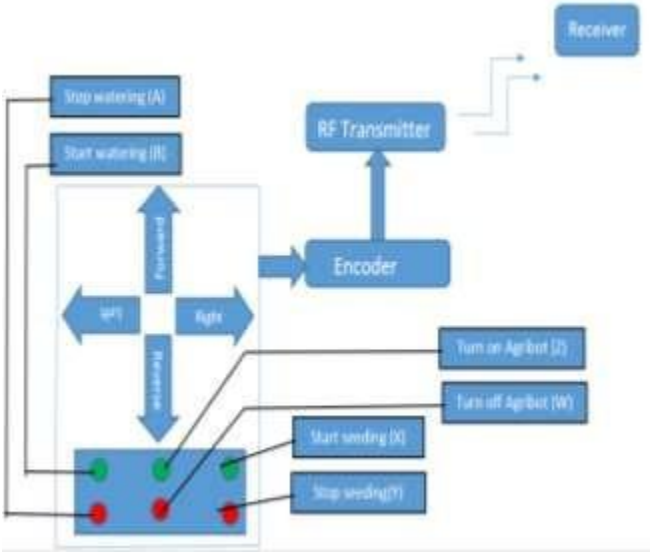

Fig-3: Block Diagram of Agribot.

5.2 Design

In the designed system, entire robot set up is controlled by Arduino UNO. The directions forward, reverse, left, right, seeding and fertilizing and cutting can be controlled switches remote. The speed of the dc motor is controlled by Arduino. The seeding, watering and fertilizing process is controlled using a dc motor.

1. Seeding:

The seeding operation takes place with help of dc motor which is controlled through Arduino Control the process of system. The seeding mechanism has a conveyor belt which has grooves on certain intervals which fits one seed. There is a tank with the respective seeds and has an opening which is programmed in such a way that it will allow only certain amount of seeds required for a particular crop. Arduino is the chip that processes the user Data and executes the same. The software inherited in this chip manipulates the data. There is also a sensor to indicate the seeds storage level.

2. Watering:

The watering mechanism is done by a special motor used in pumping water. In this there is a tank for storage of water. This tank has a sensor to give the indication of the water level. The water is pumped through a pipe using the motor. The motor is connected to the Arduino and is programmed in such a way that watering will be started just after the seeding is done. This process will continue for a certain time as programmed in the Arduino.

3. Fertilizer:

After the watering, as soon as the watering and seeding processes are done once on the field the watering tank will have fertilizer in it. This will be done with inserting a pipe inside the soil which will put the fertilizer on the top of seeds. The back grooves are given are used to cover the ploughed area so that the fertilizers put on the seeds do not evaporate. This tank also has a sensor for indicating the level of fertilizers.

4. Directions:

The direction of this robot, when the user command left direction then the robot move left direction after command. When the user command right direction in that case the robot moves right direction. Similarly, user command forward direction then the robot runs in forward direction and user command reverse direction then the robot run in reverse direction.

5. Grooves:

There are grooves on the back and front side of the chassis. The front grooves are there to plough the field for the seeding, watering and fertilizing is done. As the robot moves ahead all the processes are done and the back grooves are there to close the pits ploughed by the front grooves.

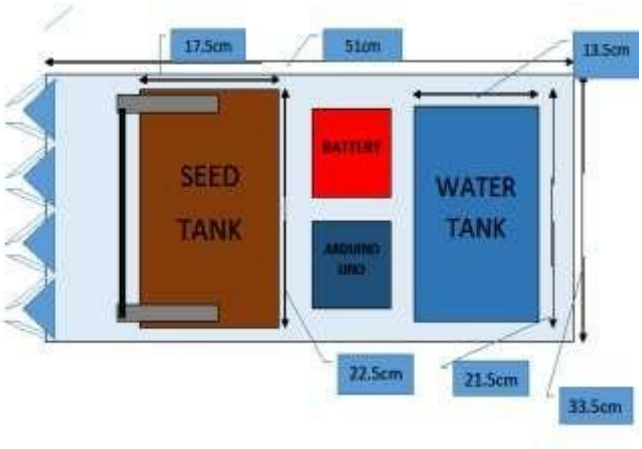

Fig -1: Design of Agribot

VI. COMPONENT SPECIFICATIONS a RF Module

1. Range in open space (Standard Conditions): 100Meters
2. RX Receiver Frequency: 433MHz
3. RX Typical Sensitivity: 105dB
4. RX Supply Current: 3.5mA
5. RX IF Frequency:1MHz
6. Low Power Consumption
7. Easy for Application
8. RX Operating Voltage:5V
9. TX Frequency Range: 433.92MHz
10. TX Supply Voltage: 3V ~6V
11. TX Out Put Power: 4 ~ 12dB

b Encoder and Decoder

1. 18 pin DIP
2. Operating Voltage: 2.4V ~12V
3. Low Power and High Noise Immunity CMOS Technology.
4. Low Standby Current and Minimum Transmission Word.
5. Built-in Oscillator needs only 5percentresistor.
6. Easy Interface with and RF or an Infrared transmission medium.
7. Minimal External Components'.

c Motor Driver L293D

1. 16 pin IC.
2. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 &15.
3. Input logic 00 or 11 will stop the corresponding motor.
4. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.
5. VCC is the voltage that it needs for its own internal operation5v.
6. Operating Voltage is9v.
7. VCCpin16isthevoltageforitsowninternalOperation.
8. The maximum voltage ranges from 5v and up to36v.

d Voltage Regulator (IC 7805)

1. IC 7805 is a 5V.
2. The maximum value for input to the voltage regulator is 35V.
3. It can provide a constant steady voltage flow of 5V for higher voltage input till the threshold limit of35V.

e Arduino UNO

1. Operating voltage:5V
2. Analog Input Pins: 6(A0 –A5)
3. Digital I/O Pins: 14(Out of which 6 provide PWM output)
4. DC Current on I/O Pins:40mA
5. Flash Memory:32KB

6. Frequency (Clock Speed):16MHz

VII. RESULT

VIII. CONCLUSION

In this project we have built a farming robot which can perform multiple functions such as seeding, fertilizing, ploughing, pesticides and watering. We have efficiently build the proposed robot to reduced man power and health hazards caused by chemicals

ACKNOWLEDGEMENT

We acknowledge our Project Guide Prof. Satish Bhoyar for his contribution in helping us throughtout the project.

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IOSR Journal of Engineering (IOSRJEN) is UGC approved Journal with Sl. No. 3240, Journal no. 48995.

Shreyash Kulkarni. “Multipurpose Agribot.” IOSR Journal of Engineering (IOSRJEN), vol. 09, no. 04, 2019, pp. 32-37.