|| Volume 5 || Issue 2 || February 2020 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH
AND ENGINEERING TRENDS

AUTONOMOUS AGRICULTURAL BOT

Arati Nimbalkar[1], Anam Shaikh[2], Jayashree Hogale[3], Manisha Gite[4]

Department of Computer Science engineering, JSCOE, Pune, India
007aratinimb@gmail.com, anam.r.shaikh04081999@gmail.com,
jayashree.b.hogale13051998@gmail.com, manisha.m.gite19061999@gmail.com

Abstract-Agriculture is the important sector of Indian Economy since many years. Indian agriculture sector accounts for 18 percent of India's gross domestic product (GDP) and provides employment to 50% of countries population. Robotics and internet of things offer better solution in the precision agriculture. The existing agriculture robot performs basic elementary Functions like harvesting, planting and spreading of pesticides. The proposed system aims at designing the autonomous agriculture robot for ploughing, sowing, watering, soil levelling controlled by android apps Bluetooth. Thus works of farmer gets reduced, increasing yield by proper maintenance using various sensors such as soil moisture, humidity, temperature and PH. The objectives of the proposed system are to dig the soil depending on the moisture level in the soil, to plough the seeds with teeth's like structure at the end to turn the top layer of the soil down, to close the seeds and level the ground automatically and to provide irrigation system by spraying water with a pump in the field. Motivation of proposed work is to decrease harvesting cost and increase productivity. The proposed hardware includes soil, moisture, temperature, humidity sensors, Arduino board, stepper motors, D.C. motors controlled through android application and Bluetooth.

Keywords: - Movement, Agricultural robot, Arduino, Robot Architecture, Agricultural Functions, Android, Sensors.

I INTRODUCTION

Farmers today spend a lot of money on machines that help them decrease labour work and increase yield of crops. There are various machines that are available for ploughing, harvesting, spraying pesticides etc., however these machines have to be manually operated to perform the required operations and moreover separate machines are used for every function. The yield and profit returns from employing this equipment are very less as compared to the investment. Another issue is the growing demands of the world's population. The World Health Organization estimates that Earth's population will touch 9 billion in 35 years which will lead to a staggering demand in increase of growth of food crops. Automation is the ideal solution to overcome all the above-mentioned shortcomings by creating machines that perform more than one operation and automating those operations to increase yield on a large scale. Agriculture is humankind's oldest and still important economic activity, providing the food, feeder, fibre and fuel necessary for our survival. Nowadays in agricultural robot development the current trend is to build smart efficient machines that will reduce the expense of the farmer while still providing one more services and higher quality. Development of a robot that can perform automated ploughing and seeding operation can be manually navigated by the farmer and stabilizes the humidity in the environment. Robotics and automation can play a significant role in enhancing agricultural production needs. We can also implement with the advancement in sensors and control systems that allow for optimal resource and integrated disease and pest management. Autonomous machines will be safer, more consistent with more efficient plant agronomy. By using the robots, agricultural operations such as watering, mechanical weed control, fruit picking, watching the farm day and night, that allows farmers to reduce the impact of environment, increase precision in an effective manner. The Advantage of Automated techniques are Robots can work nonstop and in hazardous environment, Robots can detect presence of diseases, weed, insect infestations and other stress. Due to the light weight of the robots they do not compact the soil as large machinery does.

II LITERATURE SURVEY

The robotics helps the farmers in agriculture to reduce their efforts. The robot which performs functions like automatic seeding system, automatic pest control unit, automatic compost spraying etc is designed to ease the work of the farmers and increase the outcome. This beats the adversity of farmers in farming their land irrespective of the weather conditions. The ARDUINO is used for the software implementation of the robot and the motor direction is controlled using the driver L293D. The robot is advanced with hardware parts such as seed drum alongside channels and delving system containing cutting edges in the mechanical get together of the vehicle. The sensors utilizing the Bluetooth module were effective and demonstrated the capacity of the equipment stage made out of sensors, and microcontroller. The results with the Bluetooth module constrained the information transmission which are fundamentally the restricted range. The integrated system of AGRIBOT uses Wi-Fi to communicate between 2 robots which performs activities like seeding,

spraying of fertilizers and insecticides. It uses ultrasonic proximity sensor to avert the obstacles in the path. Single seed is picked up from bulk of seeds and lead to vacuum pump and in order to suck a seed inside the funnel linear actuator is used. 100 2018 International Conference on Design Innovations for 3Cs Compute Communicate Control 978-1-5386-7523-6/18/$31.00 ©2018 IEEE DOI 10.1109/ICDI3C.2018.00030 Bluetooth module and GSM directly speak with Arduino utilizing I/O ports. Seed sowing are finished using servomotor then the pole of servomotor can be turned by the required degree which is associated with the holder containing seeds that point fall in the dirt. A level bar furnished with various jagged teeth is fixed on it to loosen the soil bed and ploughing the soil. Seed dispenser is done using servo mechanism. Parameters such as soil condition, area covered by the robot and weight of the material for levelling are examined for different motors. The advantages of these robots are reducing human intervention, ensuring proper irrigation and efficient utilization of resources. These robots are fundamentally helpful in automated weed control; usage of fertilizers based on soil condition, soil sensors for drip irrigation in rain feed areas. The proposed design is mainly used for crop establishment, plant care and selective harvesting.

III PROPOSED SYSTEM

The proposed system has the focus on the design, development and the fabrication of the multipurpose autonomous agricultural robot that performs the automatic ploughing, seeding, and watering. The robot is controlled using the Bluetooth protocol using the android application. The autonomous agricultural robot is useful for the farmers to increase the crop yield and their profit.

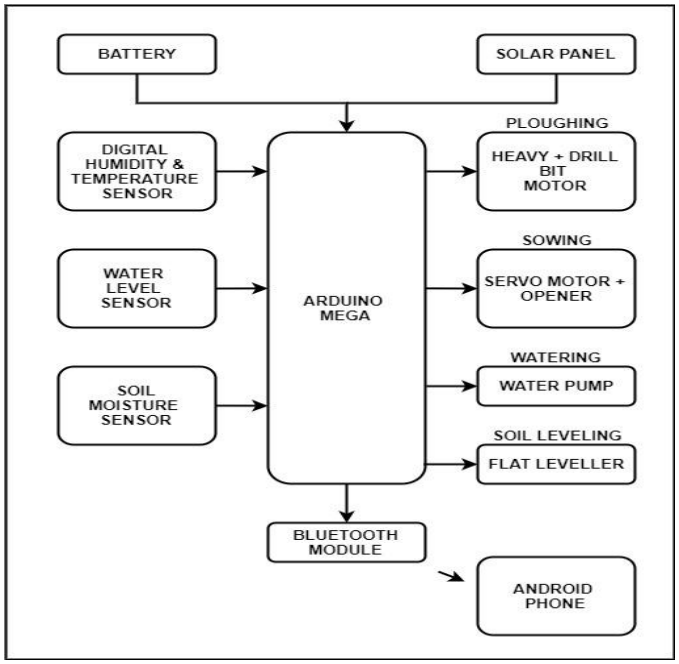

Figure 1. Proposed system

A. **Hardware model**

The whole system works on the battery. The robot requires 12V battery to operate the system. The base frame consists of four wheels connected to the four arms and one dc motor is connected to each of the wheel of the robot. Once the connection is established the robot is capable of digging, seeding, soil leveling and watering. For the digging function the Drill motor is used, sowing action is performed using Servo motor, leveling is done using flat leveler. After leveling the watering is done using Pump motor.

The DHT11 sensor is used for measuring the temperature and humidity in the surrounding of the robot. The water sensor is used for detecting the water level of the container used for watering. The soil moisture sensor is used to sense the moisture content of the soil.

The robot works in two modes. In the first mode the robot performs actions such as ploughing, sowing, watering and soil leveling along with movement of robot. In the second mode the robot performs only watering action by sensing the soil moisture content. First mode of operation is used in the initial stages while the second mode of operation is used after the initial stage when the robot only needs to water the field. The sensor data can also be manually updated by the in-app Refresh button.

The Robot is controlled over Bluetooth protocol using an Android App. The Android App consists of 5 buttons for movement of robot. The actions that would be performed by the robot are Forward, Backward, Right, Left and Stop.

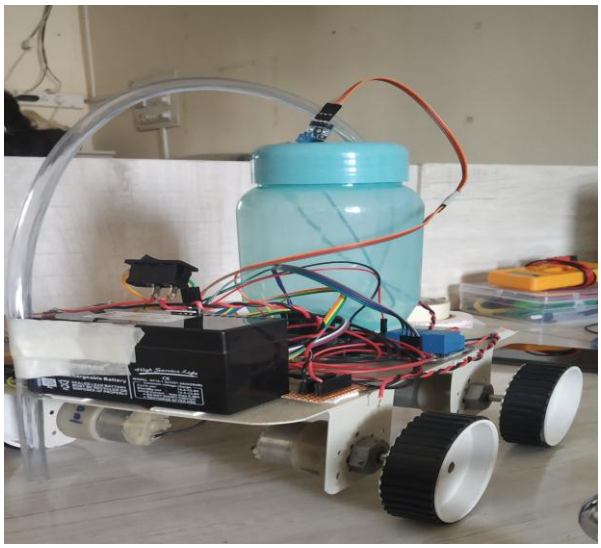

Figure 2 Front view of the robot

1) **Ploughing function:**

The main role of the ploughing is to turn over the upper layer of the soil which will bring the fresh nutrients to the surface and burying weeds and the remains of previous crops will be break down. For this purpose Drill motor is used. The direction of the drill motor is controlled by the Bluetooth app in the smart phone.

2) **Seed Sowing function:**

Seeding is planting the seed into the soil. The movement of wheels of the robot causes the shaft to throw the seeds to the field. This function is done using Servo motor.

3) **Mud closing and leveling function:**

Leveling means give a flat and even surface to the field. In the prototype model shown above, motor drivers are used to perform leveling and mud closing functions. The mud is closed in the sowed soil and the sliding mechanism is used for leveling.

4) **Watering function:**

Watering is the function in which some amount water is supplied to the plants. Watering function is carried out using Pump motor.

B. **Software model:**

The Bluetooth module is operated through the android app. The HC-05 Bluetooth module is used. The Android App consists of 5 buttons for movement of robot. The actions that would be performed by the robot are Forward, Backward, Right, Left and Stop. It also consists of list picker for selecting Bluetooth device connected to the robot. Once the Android application establishes a secure connection with the robot then the app is ready for controlling the actions of robot. There are 5 buttons for directions i.e. Button1 for Forward, Button2 for Left, Button3 for Stop, Button4 for Right, Button5 for Backward. There is also the refresh button for refreshing the values of the sensors.

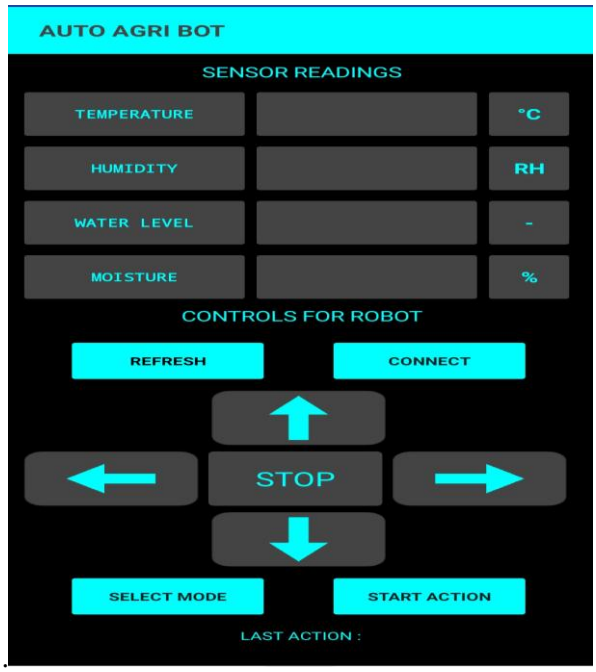

Figure 3 Application window for Bluetooth controlled robot

IV METHODOLOGY

ATMEGA2650 microcontroller is used to control various operations of proposed system.L293 D is the motor driver for controlling DC motor operations for ploughing and leveling. DC Motor used for wheels is connected to another L293D driver for proper movement of wheels. Similarly for seeding and watering functions Servo motor and Pump motor is used respectively.

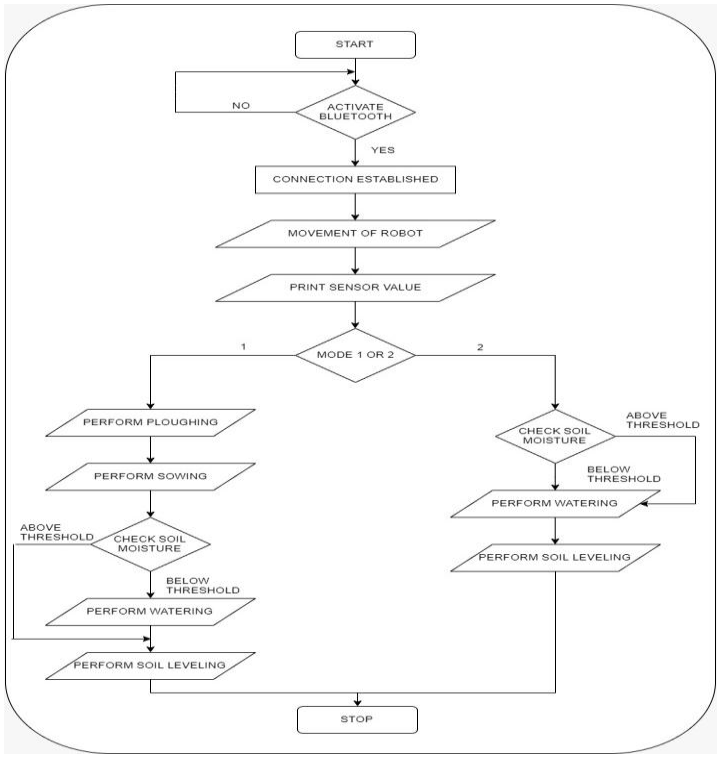

Figure 4: Flowchart for the proposed system

The flow chart for the proposed model is shown in figure 4. developed in 2 phases, hardware and software. The hardware design resulted in interfacing Bluetooth module, DC motors, ploughing system, leveling system, watering system and seeding to microcontroller through motor drivers. The software part includes developing and testing with the support of Android APP for movement of wheels, ploughing, seeding, leveling and watering functions.

TABLE I. PLOUGHING FUNCTION

S.NO	PARAMETER	Values obtained by proposed model
1	Torque of the motor	4 kg-cm
2	Speed of the motor	10 RPM
3	Distance covered by the model	11.4m
4	Time taken by the proposed model	1 min

TABLE II. SEED SOWING FUNCTION

S.NO	PARAMETER	Values obtained by proposed model
1	Torque of the motor	4 kg-cm
2	Speed of the motor	10 RPM
3	Area covered by the model	5.2mx5.2m
4	Number of seeds sowed for minute	30
4	Time taken by the proposed model	1 min

TABLE III. MUD CLOSING AND LEVELING FUNCTION

S.NO	PARAMETER	Values obtained by proposed model
1	Torque of the motor	4 kg-cm
2	Speed of the motor	10 RPM
3	Distance covered by the model	11.4m
4	Time taken by the proposed model	1 min
5	Maximum weight for leveling	150g

TABLE IV **Watering Function**

S.NO	PARAMETER	Values obtained by proposed model
1	Torque of the motor	4 kg-cm
2	Speed of the motor	10 RPM
3	Area covered by the proposed model	5.2mx5.2m
4	Time taken by the proposed model	1 sec

From the above tables it is analyzed that the prototype model of proposed system can be used to perform ploughing, seeding, leveling and watering.

V CONCLUSION

"Autonomous Agricultural Bot" has successfully implemented and tested for various functions like ploughing, seeding, leveling and watering. It was developed by agricultural robot with C programming. Various parameters like soil condition, area covered by the robot and weight of the material for leveling are analyzed for different motors. The advantages of multipurpose agricultural robots are reducing human intervention, ensuring proper irrigation and efficient utilization of resources.

In future, It can be extended by using ultrasonic sensors and cameras for performing the same operations without human operator for measuring the various parameters like soil condition, area covered by the robot and weight of the material for leveling.

REFERENCES

[1] Xue Jinlin, XU Liming, "Autonomous Agriculture Robot and its row guidance", IEEE, International Conference on Measuring Technology, 2010, published

[2]. Aljanobi.A,"A set up of mobile robotic unit for fruit harvesting", IEEE International workshop, 2010, references.

[3]. Yan Li, chunlei Xia, Jangmyung Lee, "Vision based pest detection and automatic spray in green house plant", page no 920-925, International Symposium, references.

[4]. Ashish Lalwani, mrunmai Bhide, S. K. Shah, A Review: Autonomous Agribot For Smart Farming, 46th IRF International Conference, 2015

[5]. Akhila Gollakota, M.B.Srinivas, Agribot-A multipurpose agricultural robot, India Conference (INDICON), IEEE, 2011.

[6]. Sandeep Konam, "Agricultural Aid for Mango cutting (AAM)," Electronics & Communication Engineering, RGUKT, R.K. Valley Kadapa, India, 978-1-4799-3080-7 IEEE 2014.

[7]. Rasin, Z., H. Hamzah and M.S.M. Aras, 2009. Application and evaluation of high power Zigbee based wireless sensor network in water irrigation control monitoring system. Proceedings of the IEEE Symposium on Industrial Electronics and Applications, Volume, 2, October 4-6, 2009, Kuala Lumpur, Malaysia, pp: 548-551.

[8]. M. priyadarshini, Mrs. L. Sheela, "Command based self guided digging and seed sowing rover", International Conference on Engineering Trends and Science & Humanities, ISSN: 2348 – 8379, ICETSH-2015.