

SMART AND UBIQUITOUS CONTROLLED AGRICULTURAL SYSTEM

¹Yuvabharathi.R, ²Ragavi E.S, ³Rajeshwari M

¹Asst.Professor, ^{2,3}UG students, Department of Electronics and Communication Engineering
Vel tech, Chennai-600062

Email: ¹yuvabharathir@veltechengg.com, ²esragavi@gmail.com, ³rajeshwari21996@gmail.com

Abstract—Ubiquitous controlled agricultural system is a multitasking robot designed for agricultural purposes. The working of an autonomous robot saves the time and energy required in repetitive farming tasks. It is based on length and width parameters. This performs the elementary functions such as ploughing the field, sowing the seeds, covering the seeds with soil and cutting the crops. Its working is based on the precision agriculture which enables efficient seed sowing at optimal depth and at optimal distances between crops and their rows, specific for each crop type. The field is fitted with digital humidity temperature sensors and soil sensors, which are placed at various spots which monitors the humidity, temperature and soil moisture levels continuously. Bluetooth is used to pair the robot with mobile. Power supply is provided by solar panel which is ecofriendly to environment.

Index Terms—precision agriculture, arduino, seed sowing, harvesting.

I. INTRODUCTION

Generally the traditional seed sowing methods includes the use of animal drawn funnel and pipes driller or drilling using tractors. Aimed at increasing the productivity and reducing the labour involved. This is designed to execute the basic functions required to be carried out in farms. Most of the cities in India do not have sufficient skilled manpower in agriculture sector and that of the progress of developing countries. The farmers have to use upgraded technology for cultivation activity for manual methods includes broadcasting the seeds by hand, making holes, dropping seeds by hand and cutting the plants. To overcome the manual methods, automatic robot is designed which performs digging, seed sowing and harvesting, so that human efforts will get reduced upto 90 percent. The robot starts its function by ploughing the field, then sows the seeds in ploughed area and covering the seeds sown with soil and ends the process with cutting the crops [8,9,10].

Pollution is also a big problem which is eliminated by using solar panel with a control of android application. The energy is getting from solar energy which is found abundantly in nature. Solar panel is placed on top of the robot and is connected to battery for charging and providing power to the robot. Moisture content in soil can affect the digging process to complete the process sensors are used according to the environmental conditions of working. Sensors used are Digital Humidity Temperature (DHT 11) sensor and soil sensors.

Bluetooth is used to link the devices such as the robot and mobile device.

II. METHODOLOGY

Solar panel is attached with the lead-acid battery for storing energy and it is given to power supply circuitry which is providing +5v for arduino board and +12v for driving DC motors. The robot is fixed to four wheels and the movement of these wheels is controlled using DC motors. Relay is used to control the spiked wheels which dig. A tough metal sheet is attached at the end of the robot to cover the seeds with soil. To enable this function the metal sheet is attached such that its slope touches the ground. Front end of the frame is used for harvesting purpose. It is connected to the cutter is connected to a DC motor which has more rpm. The cutter is made of aluminium sheet and sunboard. Back end of the frame is used for digging process. Metallic sheetlike structure is used for digging. A funnel has been used to drop the seed at their location. A funnel is made of plastic material and is connected to vibrating DC motor and the seeds flow through the funnel through the drilled hole on the shaft to the digged soil. This circuit has been designed on PCB board to interface all the components and control the agricultural purpose. The main component is ATMEGA 328 microcontroller which is commonly known as arduino. Key is used for input value and selection of mode of operation. It connects with digital humidity temperature sensors and soil sensor which sense the moisture of the soil.

III. LITERATURE SURVEY

The primary aim of our project is to develop a multitasking agricultural robot. It explains the agriculture techniques and robots. We listed many disadvantages that we are overcoming with our proposed ideas, programmed on single chip with multiple functions. The agricultural robots were designed only for the ploughing and seeding purposes. They are developed on separate robot for ploughing, seed sowing and separate one for harvesting which can operate automatically. The main factor to be considered for farming is the moisture and humidity content in soil. Hence along with this the irrigation process takes place as it consists of humidity sensors to measure the moisture in the air and soil sensor to measure the moisture content in soil. It gives us the option to choose the mode of its operation. It will be convenient for

farmers to operate in their desired mode like moving front, left and right in which command we provide through Bluetooth module. It is also be equipped with solar panels which will help in recharging the batteries by natural source of energy. It will also help in decreasing the use of non-renewable source of energy and will not pollute the environment.

IV. IMPLEMENTATION

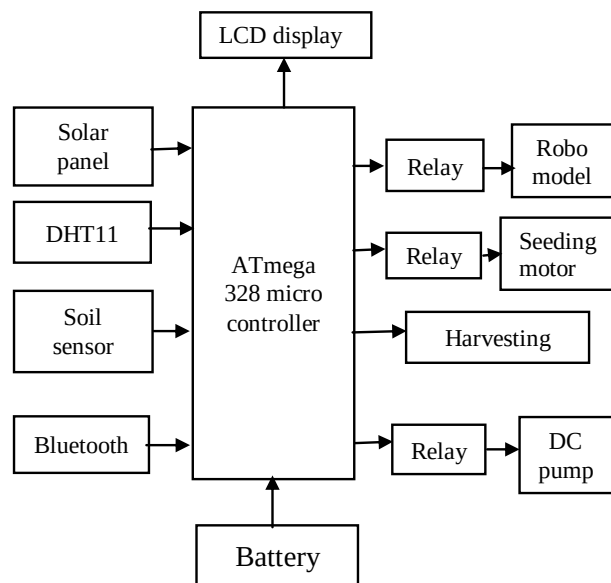


Fig.1. Block diagram

A. Mechanism of seed sowing

There are three major distances in seed sowing operation and these are digging or sowing depth for seeds, distance between two crops and two rows. This can be interpreted as row and column distance. Completion of row is detected by IR sensors by detecting the field. After detection of first row the robot will turn to its left by 90° and will cover distance between two crops rows and again turns to its left 90° to continue sowing for second row. Similarly, the end is detected after second row and it will now turns to its right by 90° cover row distance and again turns to right by 90° to cover third row. So, by alternately turning to its left and right with specific crop row distance, agribot will execute the sowing of each crop row. The block diagram is shown in Fig.1.

B. Mechanism of harvesting

A simple monitored harvester with single DC motor is used to perform the function of cutting the crops this is placed at the front side of the robot. In this harvester tool DC motor is attached with a roller like structure to rotate the

roller that cut the crop very fast. Blades are also attached in this roller.

V. ARCHITECTURE

ATMEGA 328 MICROCONTROLLER: Atmega 328 microcontroller is the heart of the system which is connected with all the sensors and other hardware assembly required to achieve the desired work. The Atmega 328 is the single chip microcontroller created by Atmel in the mega AVR family shown in Fig.2. The Atmega 328 is a simple, low powered, low cost microcontroller.

Atmega328 has 28 pins. It has 14 digital input output pins, of which 6 can be used as PWM outputs and 6 analog input output pins.

Atmega 328 microcontroller consists of two 8-bit timers/counters and one 16-bit timer/counter. It has 8 ADC channels and 10-bit 15Ksps ADC.



Fig.2. Atmega328 microcontroller

RELAY: A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of the person moving the switch it takes the relatively small amount of power to turn on the relay but the relay can control something that draws much more power. The relay is shown in Fig.3.

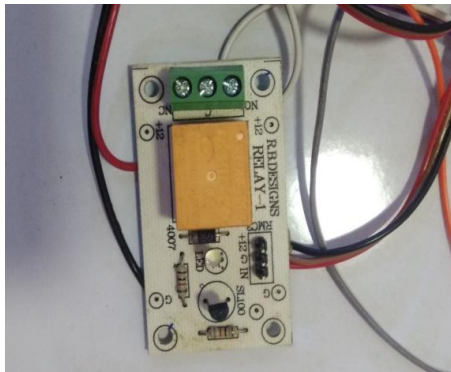


Fig.3.Relay

BLUETOOTH: Bluetooth is used as a basic universal remote control for Bluetooth enabled serial devices such as Bluetooth modules connected to the microcontroller. It is a short range wireless networking technology and it is used to link two devices such as smart phones and robot. The Bluetooth module used here is HC 05 based on SPP (serial port protocol) support, designed for transparent wireless serial connection setup. We have made use of Bluetooth control app on android as controlling software more like a remote control for the manual operation of the robot.

LCD DISPLAY: LCD abbreviation of Light Crystal Display screen is an electronic display module shown in Fig.5. A 16 digit display is the very basic module and is very commonly used in most of the devices and circuits.

1. NUMERIC LCD : Displays only numbers.
2. ALPHANUMERIC LCD : Displays numbers and alphabets.
3. GRAPHICAL LCD : Displays picture.



Fig.4.LCD Display

The advantages of LCDs are economical, easily programmable, having no limitation of displaying special

characters or animations have comparatively better brightness. The LCD displays the soil's moisture.

DIGITAL HUMIDITY TEMPERATURE SENSOR: Humidity is the measure of water in air. The amount of water vapor in air can affect human comforts as well as many manufacturing processes in industries. Measurement of humidity is important for plantation protection, dew prevention, soil moisture monitoring, etc., Fig.5. Shows the DHT sensor.

When the preset value of humidity and temperature goes high, the sensor will send message to microcontroller and after receiving messages from microcontroller water motor will switch on automatically.



Fig.5.DHT sensor

SOIL MOISTURE SENSOR: When the soil moisture is dry then the sensors send message from microcontroller water motor will switch on automatically. Soil sensor is shown in Fig.6.

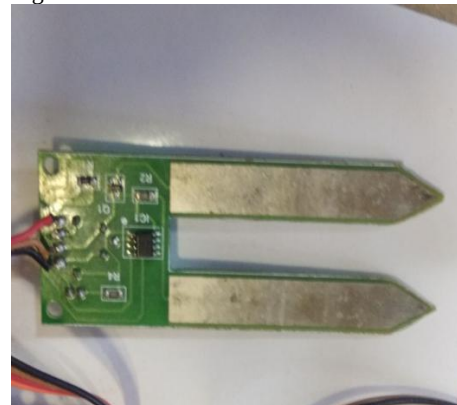


Fig.6.Soil sensor

ALGORITHM

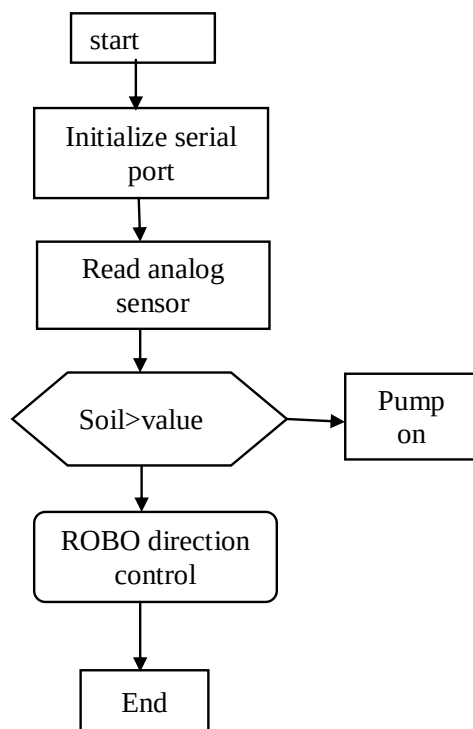


Fig.7.Flow chart

The algorithm of farming system is performed as

1. Start the machine
2. Display the parameters on the LCD screen
3. The analog sensors are to be read
4. If the soil moisture level is low, then the pump will switch on
5. When the process in work, the robot will go in forward direction according to length and after it will rotate about its axis and after the robot will do same process in that direction.

These processes can be implemented according to the requirement of user as shown in Fig.7.

VI.OUTPUT

Main objective of automating the seeding operation is to make it more efficient and accurate in its working over traditional seed sowing methods. The proposed system gives a compact, low power and low cost system with an efficient output. There are three major distances in seed sowing operation and these are digging or sowing depth for seeds, distance between two crops and two rows. They are interrupted as row and column distance. Experiments are done on the wet soil and distances covered by the robot are compared with predefined optimal distances. Multitasking

robot is also able to detect the field end by detecting the compound of the field. Accuracy obtained is satisfactory and can be improved by utilizing more mechatronic design methodology. The hardware is shown in Fig.8.

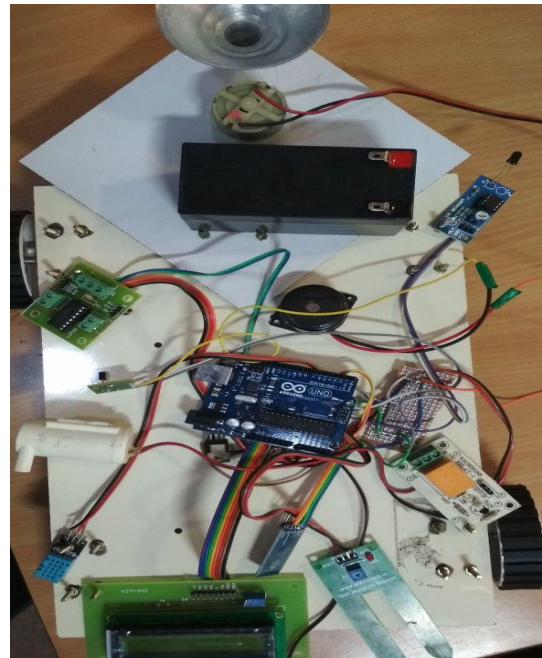


Fig.8.Hardware of robot

VII.CONCLUSION

An initial outcome of this study indicates that most of these systems that which work automatically are more flexible than traditional system. The automatic ploughing, seed sowing and harvesting robot has considerable potential to increase productivity. It is expected that this robot will change the trend of farming in the upcoming days from manual to automate. Robots can overcome the difficulties in farming the lands and also it leaves scopes of further advancement in it.

REFERENCES

1. GulamAmer, S.M.M. Mudassir, M.A Malik³, "Design and Operation of Wi-Fi Agribot Integrated System", IEEE International Conference on Industrial Instrumentation and Control, May 2015.
2. John Billingsley, Denny Oetomo, "Agricultural Robotics", IEEE Robotics & Automation Magazine, December 2009.

3. Swati D. Sambare, S.S.Belsare, "Seed Sowing Using Robotics Technology," International Journal of scientific research and management (IJSRM), 2015.
4. khanna,A;Ranjan,"Solar-powered Android based Speed Control of DC motors through Secure Bluetooth," Communication systems and network technologies CSNT 2015 international conference (IEEE Publication).
5. Golakotta,A; Shrinivas,M.B., "Agribot-A multipurpose Agricultural robot," India Conference(INDIACON), 2011 IEEE Annual conference,1-4.
6. XueJinlin, XU Liming, "Autonomous Agriculture Robot and its row guidance", IEEE, International Conference on Measuring Technology, 2010.
7. AshishLalwani, MrunmaiBhide, S. K. Shah "A Review: Autonomous Agribot For Smart Farming"201546th IRF International Conference,2015.
8. Dr.AntoBennet, M , Sankaranarayanan S, Ashokram S ,Dinesh Kumar T R,"Testing of Error Containment Capability in can Network", International Journal of Applied Engineering Research, Volume 9, Number 19 (2014) pp. 6045-6054.
9. Dr.AntoBennet, M, SankarBabu G, Natarajan S, "Reverse Room Techniques for Irreversible Data Hiding", Journal of Chemical and Pharmaceutical Sciences 08(03): 469-475, September 2015.
10. Dr.AntoBennet, M ,Sankaranarayanan S, SankarBabu G, " Performance & Analysis of Effective Iris Recognition System Using Independent Component Analysis", Journal of Chemical and Pharmaceutical Sciences 08(03): 571-576, August 2015.

