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Design and Development of Agribot

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Abstract: *The project aims on the design, development and the fabrication of the robot which can dig the soil, put the seeds, leveler to close the mud and sprayer to spray water, these whole systems of the robot work with the battery and the solar power. More than 40% of the population in the world chooses agriculture as the primary occupation, in recent years the development of the autonomous vehicles in the agriculture has experienced increased interest. The vehicle is controlled by Relay switch through IR sensor input. The language input allows a user to interact with the robot which is familiar to most of the people. The advantages of these robots are hands-free and fast data input operations. In the field of agricultural autonomous vehicle, a concept is been developed to investigate if multiple small autonomous machines could be more efficient than traditional large tractors and human forces. Keeping the above ideology in mind, a unit with the following feature is designed.*

Keywords: Agribot, Solar Powered robot, Multipurpose robot, Autonomous

I. INTRODUCTION

Most countries in recent times lack sufficient skilled manpower, notably in the agriculture industry, it has a detrimental impact the growth of developing countries. The primary goal of automation in our country is to reduce manpower; the keyword in all industrial businesses generally refers to electrical, electronic and mechanical components. Automation eliminates a lot of time consuming manual labour and speeds up production. As a result, it is the moment to automate the sector in order to solve the problem in india,70% of population is reliant on agriculture.

The robotic system is a four wheeled DC motor guided electromechnical (gives the impression of having its very own agency and artificial agent. A machine tends to the farm, which includes consideration specific columns and rows depending on the crop. The equipment may be controlled remotely, and a solar panel has been used to charge DC batteries.

II. LITERATURE REVIEW

[1] With the advancement of technology in the twenty-first century, a variety of robots have been utilized in agricultural activities, ranging from the cultivation process to the production process. The design of an insecticide spraying robot has been explored by the author. This robot has the ability to take the place of a human agricultural worker in the field. The system is made up of a spraying motor that is powered by a battery. The Arduino board, which also processes inputs from ultrasonic sensors, controls the spring activity. The robotcontrol flowchart is shown, as well as the experimental results.

[2] In another robot developed by Chaitanya et al. A web camera is interfaced with Arduino. Here live video is processed by video processor implemented with Raspberry Pi. Video processing algorithm is also implemented for diagnosing the diseases falling on the plant. The details of hardware circuit, programming and IOT interface implementation are presented.

[3] The author discusses the components of a pesticide spraying robot. The spraying approach enables the spraying project to be completed profitably and economically. The main goal of thisproject is to create a unique spraying device that assures complete inclusion of the identified article with the least amount of water. Spraying each objective separately reduces the amount of pesticide used.

[4] The author presents a prototype implementationof a seed spotting robot based on a
black line following mechanism. The algorithm is described in terms of its construction, operation, and programming. The robot is constructed using an open-source Firebird microcontroller. The servo mechanism is designed to sow the

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seeds in the proper location.The author has created a solar-powered semi- automated agricultural pesticides spring robot that runs on an Android app. The paper includes detailson mechanical modelling, system development, and an example of an Android app. The robot that has been constructed has proven to be a productiveand efficient machine that is simple to manoeuvre and control. The robot can traverse a variety of terrains and soils. Johnson geared motor allows forprecise navigation since it moves precisely in response to the pulses received and has no inertia, unlike a regular DC motor. Wireless technology allows for remote control of the robot (BLE, Wi- Fi). A smartphone app is used to control the robot movement as well as the spraying of pesticides. Asa result, the robot control is simple and user-friendly, allowing farmers to effortlessly operate this sophisticated vehicle.

[5] The use of a radio frequency driven robot to sowseeds is demonstrated. The robot's RF receiverreceives commands from a remote operator and performs motion-related activities such as forward,reverse, left, and right turns. Infrared sensors are also included in the Robot, which aid with obstacledetection and are notified by a buzzer as an auditory indicator.

[6] An autonomous seed with a robot that avoids collisions is shown. The rotating wheels, seed, andother features of robot design Graphical representations of the sowing disc and bucket, seed chamber, and storage tank are provided. Photographs of evolved robots are shown, withvarious operations indicated. This robot's obstacledetecting feature is an added bonus.

[7] It is given the design and fabrication of a seed viewing and grass cutting robot machine. Theauthor provides information on major buildingcomponents such as DC motors, bearings, gears,seed sowing discs, and buckets. The created machine has a lot of promise for enhancing planting output. Until recently, the tractor was the primary traction machine used in farming. The goal of thisseed planting equipment will be accomplished withits customization. As a result, it is necessary topromote this technology and make it cheap to evensmall-scale farmers.

[8] The goal of the autonomous seed sowing robotis to boost output while reducing seed wastage andseed sowing time. Solar-powered DC motors are driven by an L298N driver circuit with an Arduino UNO control kit in this automatic seed sowing system. To detect the impediment in the path and the end of each row, an ultrasonic sensor is also fitted. The built robot additionally includes a GSMmodule that sends SMS when the mission is completed. The author has described the seed sowing robot's construction, operation, benefits, and drawbacks in detail..

[9] In the agriculture industry, equipment that demands less human work and time, as well as lower implementation costs, is critical. A seed sowing robot is a technology that assists farmers inspreading seeds in the desired spot, saving them time and money. One of the most important aspectsof farming is seed sowing. It necessitates a significant amount of human labour as well as time.The goal of this project is to develop and build a smart seed sowing robot for the aforementioned duty. One robotic arm sows the seeds from the seeds container in this smart seed sowing robot. Toacquire the appropriate positions for the robot arm,the mobile application is used to control it. As a result, this method uses a cleverly built mechanicalmechanism to entirely automate the seed sowing procedure. This robot saves time and money by reducing the effort and overall cost of sowing seeds..

[10] The author discusses a step-by-step approachfor designing and fabricating an autonomous seedssowing robot. The technique is described in depth,as well as the results of the experiments. Therequired depth of the seeds to be sowed should be raised by around 8 cm for better and strongergermination.

[11] A lot of work has gone into developing a wireless gesture control robot. The work achieved toward developing a future precision autonomous agricultural system was presented in this paper. Sowing seeds is a difficult farming activity that the robot completes. Because the robot is controlled by hand gestures, its mobility may be accurately regulated.

[12] Agricultural process automation is projected to have a favorable influence on the environment by reducing waste and enhancing food security while also maximizing resource use. Precision spraying is a technique for reducing pesticide losses while also lowering chemical residues in thesoil. We designed a clever and unique electricsprayer that can be constructed by a robot in this study.

[13] The sprayer contains a crop sensing system thatcalculates leaf density using picture histograms(local binary pattern (LBP), vegetation index, average, and hue) and a support vector machine (SVM) classifier. This density can then be utilised as a reference value for a controller that controls the Sprayer's air flow, water rate, and water density. This perception system was designed and evaluatedwith a dataset that was made available to the scientific community, and it

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is an important contribution.

[14] Robots, which are automated robots, are frequently utilised in machineries, industries, and the medical area. Robots are also utilised in agriculture to accomplish tasks such fruit picking, ploughing, and harvesting. These robots, on the other hand, are pre-defined, with mechanisms and capabilities already given. There is a danger that these robots will malfunction. If a robot makes a mistake, it can inflict a lot of damage, therefore automated robots always have disadvantages,whereas self-operated robots can be prevented from breaking down and exerting themselves.

[15] A thorough examination of various Human- Machine Interaction strategies based on gestures has been presented. An accelerometer can be used to capture gestures, however with the advancement of smartphones, its standalone application has become obsolete. Accelerometer-based technologythat uses RF signals to operate a robotic car utilising a small 3-axis accelerometer.

[16] Radio frequency can travel over longer in the distances than infrared, many present technologiesand transmission mediums rely only on it. The ultrasonic sensor detects any obstacles or the field end. If Robot 1 need seed for sowing, it transmits arequest for assistance to another robot via the RFmodule.

[17] An accelerometer detects human hand movement; when the hand gestures towards the ground, the capacitance between the moving and stationary plates reduces as the dielectric (i.e. air) between them lowers, and the signal is conveyed to the microcontroller in analogue form. The received analogue signal is then fed into the microcontroller inbuilt ADC (Analog to Digital), which processes the signal before sending it to the RF module. TheRF module will receive the signal from the microcontroller, which operates at 433KHz.

[18] Both of the robots in the farms connect with each other by RF, sending data and their current positions on a constant basis. The signal is received from the transmitter as digital 4 bit data, which is then passed to the microcontroller, which processes it further before sending the signal to the lifting mechanism and wheel rotational driver.

III. METHODOLOGY

The system is separated into two major sections:the first is the user section, and the second is the robot section. The first portion is a laptop or mobiledevice that communicates with the second part,which is the robot section. As a result, whencompared to those who use a traditional largecomputer system, a laptop computer or a mobilephone will make the user section more convenientand portable. The User section and the Robot Endcan communicate in a variety of ways. The user section and the robot end communicate in a varietyof ways. Signals that are required can be transmitted. Employing Radio Frequencytechnology or a Zigbee device (Zigbee is a wirelesstechnology developed as an open worldwidestandard to support the system of low-cost, low-power internet of things networks) or Bluetooth technology.

They do, however, have a relatively limited range.To avoid the low range problem and to communicate quickly, we may bring all parts onto the internet platform, which is the basic idea of the internet of things. The Arduino IDE software is across-platform application that can be built in C and C++, and it can be used to connect the RGV tothe internet in this case. The Arduino Integrated Development Environment (IDE) software is a virtual object database, also known as an object relational mapping (ORM), that may be used tocreate prototypes and Internet of Things applications. An integrated development environment (IDE) is a software application bundlethat provides device programmers with a variety ofsoftware application and development possibilities. An IDE comes with built-in source code that maybe edited, automation tools, and a debugger, whichis a tool for finding and fixing software bugs. Using theArduino IDE application, we can sendcommands and control the RGV.

The Arduino and Node MCU ESP 8266 microcontrollers are mounted on the main body structure of the robot, which serves as the supporting framework for the complete robotic vehicle, in the Remote Guided Vehicle. 100 RPM DC motors are attached to the wheels beneath the vehicle chassis body in this RGV. Each motor is powered by a 12V supply from an external battery source connected to the vehicle chassis. A relay driver connects the Node MCU (ESP8266) to the DC motors. A relay driver is linked to each 12 V DC motor for amplification purposes. A relay driver is nothing more than an electro-magnetic switch that is used to turn ON/OFF a low voltage circuit.

The microcontroller was programmed using theArduino IDE software to allow the robot to run in the desired direction. This is the operation that islinked with it in manual mode. Sensors such as ultrasonic sensors and optical sensors that

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aredirectly attached to microcontroller's Input/Outputpins can be used. Ultrasonic sensors function on thesame concept as bats, which use echolocation tocatch prey and navigate in the dark.

IV. PROPOSED SYSTEM

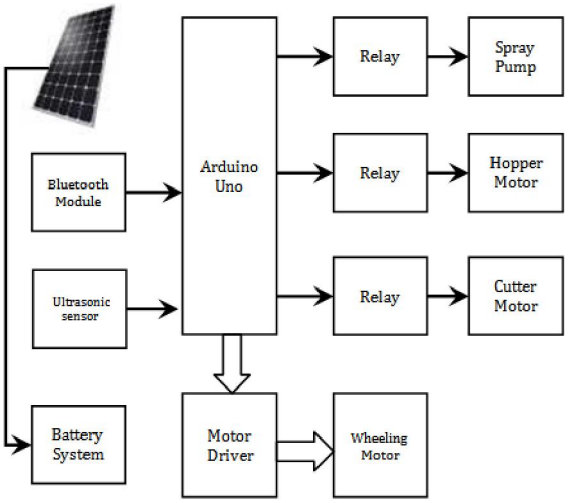

Fig 1. Block diagram Agribot

The block diagram of proposed multifunctionalagricultural robot is shown in figure. The system consists of a controller that takes input from aBluetooth module via Bluetooth remote controller.The data received by the Bluetooth module is processed by the controller and the actions taken are - control the motion of the robot, seed hopper start stop operation, sprayer on off operation and cutter on off operation. The system is also supported with the solar photovoltaic (PV) panel sfor battery charging purpose.

V. HARDWARE CONFIGURATION

5.1 Arduino Uno

Fig 2. Arduino Uno

Arduino UNO is a commonly used open-source microcontroller board made by Arduino and basedon the AT mega 328 microprocessor. The board has digital and analogue input/output (I/O) pins that can be connected to a variety of expansion boards. (shields) and other circuits There are 14 digital pins and 6 analogue pins on the board. It may be programmed through a type B USB connector using the Arduino IDE (Integrated Development Environment). It accepts voltages between 7 and 20volts and can be powered by a USB connection or an external 9-volt battery.

5.2 PV Panel

Fig 3. PV cell

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12V voltage
20W of power
1.5 amps of current

5.3 Battery

Fig 4. Battery

A lead acid battery with the following parameterswas chosen for the created robot:

- Voltage – 12V
- Current rating – 1.3AHr
- Type – sealed lead acid

5.4 Bluetooth Module

Fig 5. Bluetooth Module

HC-05 is a Bluetooth module which is designed forwireless communication. Bluetooth serial modulesallow all serial enabled devices to communicate with each other using Bluetooth.

5.5 Relay

Fig 6. Relay

4 channels 5V, 7A relay board is selected for interfacing actuators. These relays are controlled with Arduino Uno and the controlled device iswater pump motor. As all the sensors are working on 5V voltage levels relay having control voltage of 5V is chosen.

5.6 Motor Drivers

Fig 7. Motor Drivers

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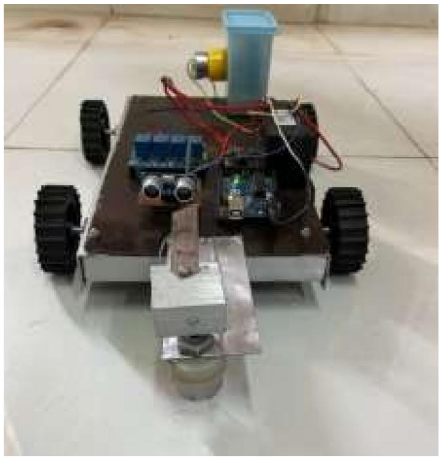
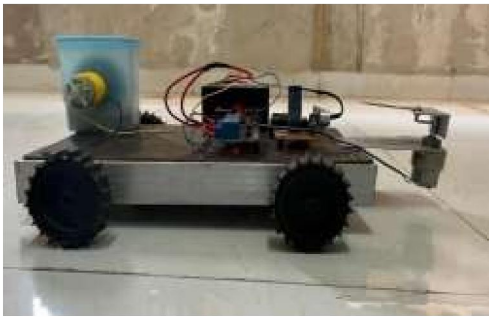
The L293D is a 16-pin motor driver IC that is widely used. It is mostly used to drive motors, as the name implies. A single L293D IC can drive two DC motors at the same time, and the two motors' directions can be regulated individually.

VI. IMPLEMENTATION OF THE ROBOT:

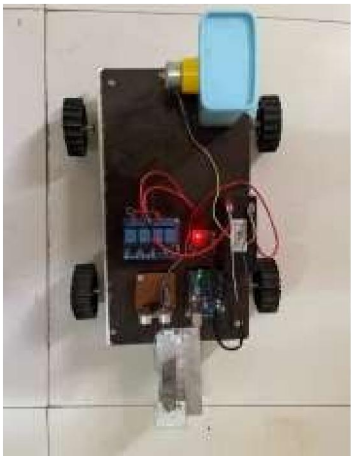
6.1 Front View



6.2 Side View



6.3 Top View



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VII. FUTURE SCOPE

Because of its utility in agriculture and ability to minimise workload, this sort of robot has a bright future.

- By lowering the amount of pesticide liquid that needs to be sprayed, it saves time and money.
- It will help farmers work in any season and under any circumstances.
- It would reduce the chance of farmers developing various respiratory and physical issues.
- It can be built to automatically collect and analyse data from the farming field, as well as perform pre-defined tasks.
- Increasing the usage of renewable energy sources like wind power will also assist to lessen the demand for more batteries.
- Voice-controlled navigation can be employed for robotic motions.
- To increase the performance of IoT-based smart agriculture systems, modern technologies such as AI and machine learning can be combined.
- Autonomous robots based on artificial intelligence (AI) can be created expressly for agricultural applications.
- Machine learning may be used to analyse video to evaluate agricultural conditions, such as examining the condition of a leaf to see whether it has been attacked by pests and then ordering the machine to take the right action.

VIII. CONCLUSION

This describes the multifunctional agricultural robot. The built robot can be controlled over Bluetooth via the user's mobile phone app. A prototype model is used to demonstrate the three functions of seed planting (seed flinging), insecticide/pesticide spraying, and crop cutting.

The robot is powered by a battery that is charged using solar PV panels. As a result, the robot is environmentally beneficial. The complete system is made more user-friendly by the mobile app for robot control.

This robot will undoubtedly reduce human effort in the agricultural field, allowing farmers to perform multiple tasks with a single system.

The potential for robot-enhanced productivity in agriculture is enormous, and robots are increasingly appearing on farms in various forms and in increasing numbers. Other issues with autonomous farm equipment are likely to be solved by technological advancements. Although this technology may be in our future, there are compelling reasons to believe that it will not simply replace the human driver with a computer. It may necessitate a reassessment of crop production methods. Crop production can be done more efficiently and affordably using a swarm of small machines rather than a few giant ones. One of the advantages of the smaller machines is that they may be more acceptable to those who do not work on farms. Agriculture tasks are tedious, risky, and need intelligence and quick, yet very repeated decisions; hence, robots can effectively replace human operators. Machines can accurately detect higher-quality items (colour, firmness, weight, density, ripeness, size, and form). Robots have the potential to improve our lives, but they also have drawbacks. In our country's current scenario, all agricultural machines are operated manually since using a petrol engine or tractor is expensive, and farmers can't work for long periods of time manually. To prevent this problem, we need some kind of power source system to run.

- Create a prototype model of a drilling and seed sowing machine system using the restricted resources and budget available.
- If this initiative is successful, it will give farmers with a low-cost multipurpose solution.

REFERENCES

[1]. A.M. Kassim, M. F. N. M. Termezai, A. K. R. A. Jaya, A. H. Azahar, S Sivarao, F. A. Jafar, H.I Jaafar, M. S. M. Aras, "Design and Development of Autonomous Pesticide Sprayer Robot for Fertigation Farm", International Journal of Advanced Computer Science and Applications, Vol. 11, No. 2, 2020

[2]. Pvr Chaitanya, Dileep Kotte, A. Srinath, K. B. Kalyan, "Development of Smart Pesticide Spraying Robot", International Journal of Recent Technology and Engineering (IJRTE), ISSN: 2277-3878,

Volume-8 Issue-5, January 2020

[3]. P. Rajesh Kanna and R. Vikram, "Agricultural Robot – A pesticide spraying device", International Journal of Future Generation Communication and Networking, Vol. 13, No. 1, (2020), pp. 150-160

[4]. Pradeep Gorre, Deepan Leburu, Srinivas Kopparthi, Navakishore Kayala, "Design and Implementation of Seed Sowing Agricultural Robot", International Journal of Scientific Engineering and Research (IJSER), ISSN (Online): 2347-3878, Volume 5 Issue 3, March 2017

[5]. Ashutosh B. Adhav, Vivek D. Jagtap, Rushabh R. Sonawane, Ganesh K. Gaikwad, "Agricultural Pesticide Spraying Robotic System Controlled Using Android Application", International Journal of Innovations In Engineering Research And Technology [IJIERT], Issn: 2394-3696, Volume 7, Issue 4, Apr.-2020

[6]. Vidya Yedave, Punam Bhosale, Jyoti Shinde, Jagdish Hallur, "Automatic Seed Sowing Robot", International Research Journal of Engineering and Technology (IRJET), Volume: 06 Issue: 04 | Apr 2019

[7]. Trupti A. Shinde, Jayashree. S. Awati, "Design and Development of Automatic Seed Sowing Machine", SSRG International Journal of Electronics and Communication Engineering - (ICRTESTM) - Special Issue – April 2017

[8]. K. Senthilkumar, Alex George Paul, Amudhan. A, Chanthu. V, Ibrahim Sheriff, "Design and Fabrication of Automated Seed Sowing Machine and Grass Cutter", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181, Special Issue – 2019

[9]. P. Premalatha and Sharath Singh, "Design and Development of Automatic Seed Sowing Machine", Asian Journal of Electrical Sciences, ISSN: 2249-6297, Vol. 8, No. S1, 2019, pp. 51-54

[10]. Pankaj Kumar, G. Ashok "Design and fabrication of smart seed sowing robot", Materials Today:Proceedings,ELSEVIER, https://doi.org/10.1016/j.matpr.2020.07.432

[11]. K. Saravanan, S.P. Sundar Singh Sivam, S. Rajendrakumar, K. Sathiyamoorthy, "Design and Fabrication of Automatic Seed Sowing Robot for Agricultural Field", International Journal of Pure and Applied Mathematics, Volume 120 No. 6, 2018, 11749-11766

[12]. Akshay Nilawar, Pradnya P. Shilvant, Parmar Harpreet Kaur, "Wireless Agricultural Seed Sowing Robot", International Journal of Latest Technology in Engineering, Management Science Volume VII, Issue IV, April 2018 | ISSN 2278- 2540

[13]. André Rodrigues Baltazar, Filipe Neves dos Santos, António Paulo Moreira, António Valente and José Boaventura Cunha, "Smarter Robotic Sprayer System for Precision Agriculture", MDPI Journal of Electronics, 2021