IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Solar Powered Automated Multi-Tasking Agricultural Robot

[1]Sannidi Harshavardhan, [2]Perabathulla Veera Sai pullaiah naidu , [3]Sattu Bhavani,[4]Mamidi Manoj,[5]K.Giri babu

[1]Student,[2]Student,[3]Student,[4]Student,[5]Associate Professor

Bachelor of technology in Electrical and Electronics Engineering.

[1]J.B Institute of Engineering and Technology, Hyderabad, India.

Abstract:

More than forty percentage of the populace in the world chooses agriculture as the main occupation. The principal goal of the task is to diagram multitasking car for agriculture which ought to run automatically. It is designed to reduce the labor of farmers in addition to extend the pace and accuracy of the work. The manage and monitoring are primarily based on web of things, due to which the genuine fame of the discipline can be monitored and managed from any phase of world the use of internet. In our challenge we have two manipulate structures i.e. subject manage and robotic control. In area manage the soil moisture, temperature and humidity is sensed the usage of appropriate sensors and the subject is managed by using appropriate movements as nicely as the facts is up to date to the farmer with the aid of an app. The theft of plants by means of human beings and the assault of animals in the agricultural land motive heavy loss in cultivation. For intruder detection in the agricultural discipline we can use IR sensor and do photo processing approach to realize them. Usually, fires show up naturally in agricultural fields, ignited with the aid of warmth from the solar or a lightning strike. So, we sketch a machine in the subject to extinguish such hearth at very early stage. The robotic manipulate has a digital camera to grant a stay imaginative and prescient of the subject so whilst it performs its simple operations, we can display everything. The whole device can be switched to computerized mode for entire manage of the farm by using the robotic and guide mode for manage by using farmer. The robotic sprays pesticides and weedicides to manage assault of pest and weeds in the field. Also, the battery can be recharged with the aid of the photo voltaic panel stored above the vehicle. This ensures the the usage of eco-friendly electricity supply and prevents normal charging of the vehicle.

Keywords- Automation, control systems, Raspberry, solar Panel, microcontrollers.

I. INTRODUCTION

By fusing advanced automation technologies with renewable energy sources, a Solar-Powered Automated Multi-Tasking Agricultural System is a revolutionary development in contemporary agriculture that improves productivity, sustainability, and efficiency. From crop planting and irrigation to harvesting and pest control, this system uses solar energy to power a range of automated agricultural operations. This technology minimizes dependency on non-renewable energy sources while reducing the environmental impact of conventional farming methods by using solar power. This makes it a more economical and sustainable way to meet the world's expanding food demand. Fundamentally, the system uses solar panels to produce electricity, which drives a number of machines and robotic equipment that perform necessary farming tasks. Solar energy is perfect for use because it is a clean and renewable resource. in farming, particularly in areas with lots of sunlight. Solar energy lowers greenhouse gas emissions, lowers operating costs, and lessens the negative environmental effects of conventional farming methods by taking the place of fossil fuels or conventional grid electricity. Incorporating renewable energy guarantees that the system is not only economical but also advances the more general objectives of climate change mitigation and sustainable farming. Another significant innovation in the system is the automation aspect. Numerous agricultural tasks, including seeding, crop irrigation, fertilizer application, pesticide spraying, and harvesting, are carried out by automated equipment and robotics. By drastically lowering the need for manual labor, this automation helps to alleviate the growing labor shortage in agriculture. Previously labor-intensive tasks can now be completed by be carried out precisely and effectively by self-governing machines, reducing labor expenses and time while increasing overall productivity. Additionally, automated systems offer more accurate and consistent task execution, which lowers human error and boosts operational efficiency. The multi-tasking capability of the Solar-Powered Automated Multi-Tasking Agricultural System is one of its most notable features. This system is made to carry out a wide range of tasks either sequentially or simultaneously, in contrast to traditional agricultural systems that need separate machinery or human intervention for each task. For instance, a single robot could apply fertilizer, water crops, and plant seeds all at once, significantly cutting down on the time and materials required to finish these tasks. This feature is especially helpful for large farms, where the effectiveness of handling several tasks with a single system can result in increased crop yields and considerable cost savings. The system's use of sensors and artificial intelligence (AI) to track and improve farming methods is another essential component. Sensors built into the system collect data on crop health, temperature, moisture content, and soil conditions in real time. In order to make well-informed decisions regarding pest control, fertilizer application, irrigation schedules, and other interventions, AI algorithms evaluate this data. The system can precisely adjust to maximize crop growth, minimize waste, and preserve resources like water and fertilizer by employing this data-driven methodology. By applying the proper amount of resources precisely where and when they are needed, this precision farming method minimizes the impact on the environment and maximizes agricultural productivity.

II. METHODOLOGY.

I. MOTION CONTROL:-

Four DC equipment motors (12V) can be used to manage movement. The motor driver circuit can be connected to the DC motors. The low enter signal is changed to an excessive enter signal by the motor driver. Excessive torque is produced by the DC tools motor. The Raspberry Pi controls the motor driver, which in turn powers the motors. Using image processing algorithms, the locomotion can function independently. It can also be controlled via an app's guide function.

II. SowerofSeeds:

Here, we design and build a fully automated seed sower that activates when the user turns the app's seed sower button ON. Its funnel-shaped seed collector directs the seeds toward a wheel configuration. The shaft, which has a tiny bracket for pouring seeds into a wheel, is connected to the motor. The seed sower begins putting seeds into the ground as soon as the switch is turned on. This guarantees consistent seed implantation in the field

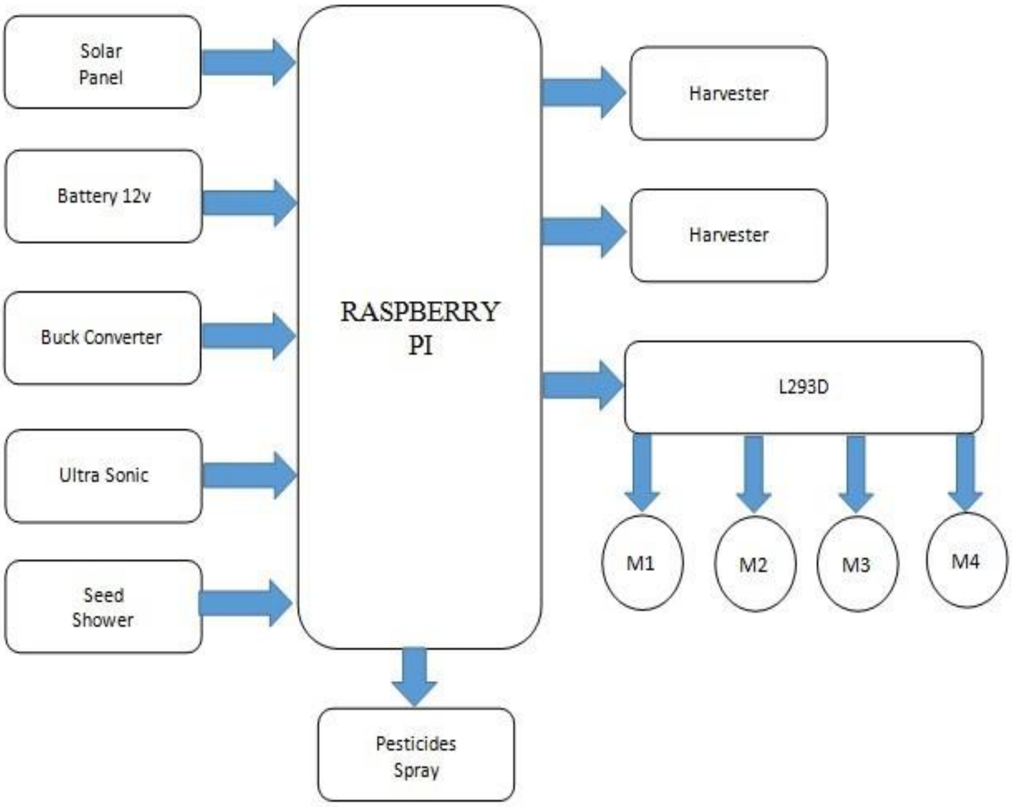
III. Harvester:

In this configuration, the crop is cut by a revolving blade while the robot moves. The crop is sliced smoothly because the blade is powered by a high-speed motor. This arrangement works well with industrial plants like wheat and paddy.

IV. Monitoring:

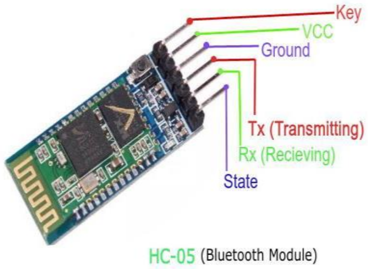
While it carries out its basic functions, we can screen everything in and around the field thanks to its digital camera, which will provide an imaginative and prescient view of the area. It serves as an eye for accessing IOT devices. The field is also monitored and controlled by additional sensors, such as moisture, temperature, and humidity sensors, PIR sensors, and fireplace sensors.

BLOCK DIAGRAM

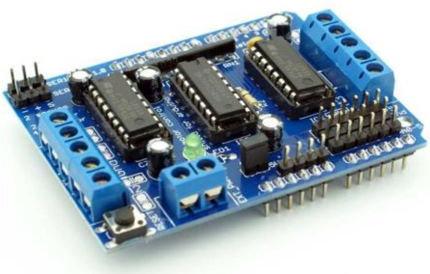


”

The device hardware's useful block graph is suggested by the discern. In order to control the robot, the device is made to accept a variety of inputs. The sensors' inputs are integrated and processed. The Serial Monitor shows the results. The software functions as a person interface, allowing for a record of the person's current reputation. The statistics are automatically updated on the screen after the user has connected to the receiver unit. Because the graph is modular, adding more sensors to measure and track various parameters is simple and convenient. The micro controller board is then updated with the sensor values.



a) b)



C) D)

(a) Raspberry 5, (b) HC05 Bluetooth, (c) L293D Motor and (d) Lithium Ferro Phosphate Battery

A.Raspberry5

The Raspberry Pi 3B+ is a tiny board computer. It can perform some tasks similar to those of a standard computer and has a CPU, GPU, USP ports and I/O pins, Wi-Fi, Bluetooth, USB, and network boot. The system on chip, or SOC, is faster than the Pi 2 and Pi 3 models because it combines the CPU and GPU into a single package. The Raspberry Pi 3B+'s central processing unit, or CPU, handles its fundamental input/output, logical, and mathematical functions.APU and GPU are the two components that make up CPU.Arithmetic processing units, or APUs, are devices that carry out arithmetic operations. A specialized electronic circuit is known as a graphic processing unit, or GPU. Rapid manipulation and after memory are used to speed up the creation of an image in a frame buffer that is meant for output to a screen. The Raspberry Pi 3B+ uses the BCM 2837B0 chip.A POE header and two USB ports are present. It features a composite video port, 40 GPIO pins, and a 4-pole stereo output. It has both DSI and CSI.DSI stands for display serial interface, and CSI for camera serial interface. When the Raspberry Pi 3B+ detects a green plant, it receives power from the power supply regulator and receives a signal from the camera.

B.TheHC05BluetoothModule

The Bluetooth SPP (Serial Port Protocol) module uses wireless technology to enable a secretly networked serial connection. Because it can be configured as either a Master or Slave, the HC-05 Bluetooth Module is an excellent option for wireless communication. This SP Bluetooth module is certified to work with Bluetooth V2.0+EDR (Enhanced Data Rate) at 3 Mbps modulation and comes with a radio transceiver and baseband operating at 2.4GHz.

C. Motor Driver L293D

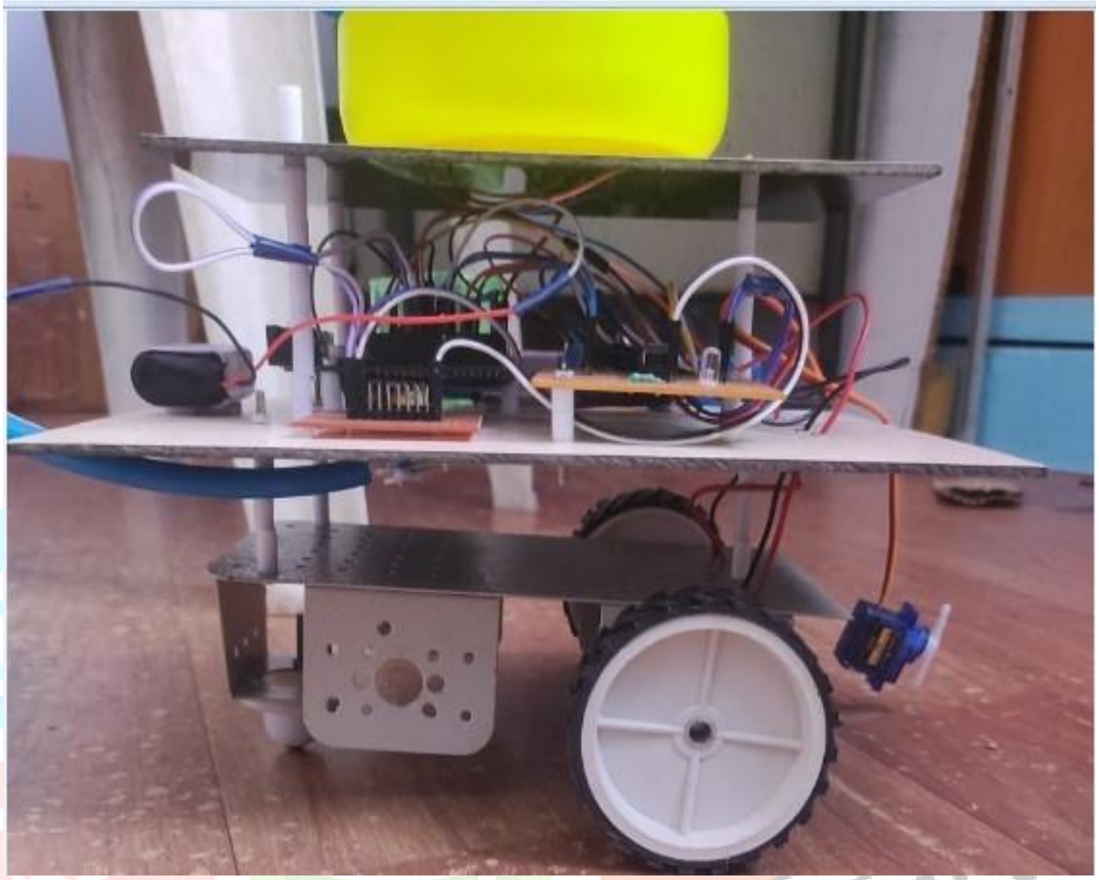
Two DC motors can be driven simultaneously in opposite directions by the 16-pin L293D Motor Driver IC. At voltages ranging from 4.5 V to 36 V, the L293D can provide up to 600 mA (per channel) of driving current.

D.FerrophosphateLithiumBattery

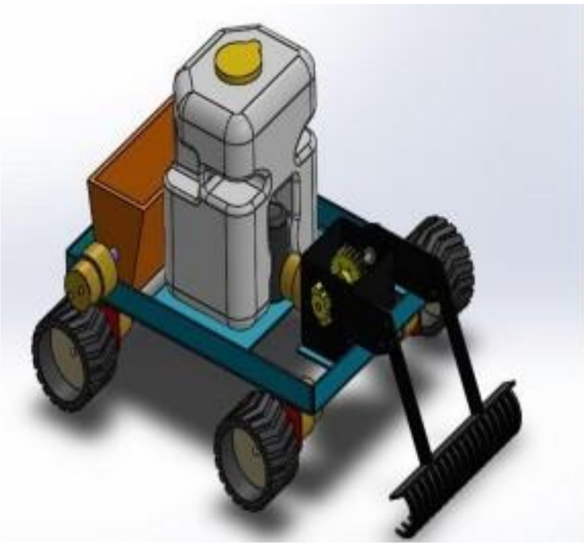
The Lithium Ferro Phosphate battery, a subset of the lithium-ion battery family, uses graphitic carbon with a metallic backing as its anode. LFP batteries are finding a number of applications in automobiles, large-scale stationary applications, and backup power due to their lower cost, increased safety, decreased toxicity, longer cycle life, and other characteristics.

IV.RESULTSANDDISCUSSIONS

The photovoltaic panel, which turns sunlight into electricity, gives the designed robot strength. The charging circuit receives this electrical energy in order to raise the battery's voltage to 12V. The controller, motor driver, and other mechanisms are strengthened by this battery.
The full-fledged photovoltaic-powered multipurpose agricultural robot prototype is displayed.



The prototype was tested with three different seed types—wheat, rice, and gram—in regular agricultural soil. These seeds are kept in a funnel. As seen in fig. 4, the Android app Bluetooth terminal HC-05 controls every aspect of the robot's operation.



Firstly it paired app with the HC-05 module. The movement of robot controlled by following commands 0: Stop, 1: Forward movement, 2: Backward movement, 3: Right turn, 4: Left turn When we send '5' and '7' commands the robot starts to plugging, simultaneously dispensing seeds side by side as shown in fig:5. For plugging operation plough is tilts in a downward direction at a specific angle to provide proper dept for rows. Command '8' is provided to move plough to its original position. Funnels are mounted on a slider. Command '5' is sent then slider starts moving to and fro direction. In this operation seeds were distributed in rows, however, the distance between seeds was uniform. Command '6' is used to stop slider. Grass cutting.The mechanism features a sharp-edged circular cutter. The cutter is rotated by sending the command "a." As seen in fig. 6, this cutter was successful in cutting weeds. To halt the cutter's rotation, "b" is sent. The water can be stored in the provided container. To sprinkling water on the field, "c" is sent. To stop sprinkling, use the letter "d."

CONCLUSION

In order to minimize the amount of manpower required for basic farm operations, we have created a self-sufficient robotic and field control device. Due to the influence of the IT sector's intervention and modernization, the number of people working in agricultural regions has decreased in recent years. The farm is managed in a modern manner thanks to this work. The benefit of this work is increased when IOT is used in agricultural areas. Additionally, because it uses photovoltaic power, this tool is even more environmentally friendly.

FUTURE SCOPE

Plowing, seeding, and fertilizer spraying are the three main tasks that the AgRo-Bot completes. Can we also include a harvesting operation? This assignment has a lot of room for improvement in the future. Numerous sensors can be added to this early prototype to increase the robot's intelligence and make it aware of its limitations. It is possible to add sensors to determine the land's depth so that seeds can be planted.

REFERENCES

[1] Online].Available: http://blog.robotiq.com/top10-robotic-application-in-agriculturalindustry. [Accessed December 2019].

[2] [Online].Available:https://components101.com/wi reless/hc-05-bluetoothmodule. [Accessed Nov 2019].

[3] S. Umarkar and A. Karwankar, "Automated Seed Sowing Agribot using Arduino", IEEE Conference on Communication and Signal Processing, April 2016, pp.1379-1383.

[4] M.D.I. Sujon, R. Nasir, M.M.I. Habib, M.I. Nomaan J. Baidya and M.R. Islam "Agribot: Arduino Controlled Autonomous Multipurpose Farm Machinery Robot for Small to medium scale cultivation", IEEE conference on intelligent autonomous systems,March 2018, pp.155- 159.

[5] P.V.S. Jayakrisna, M.S. Reddy, N.J. Sai, N. Susheel and K.P. Peeyush, "Autonomous Seed Sowing Agricultural Robot", in IEEE Conference on advances in computing, communications and informatics (ICACCI),2018, pp.2332-2336.

[6]] P.V.S. Jayakrisna, M.S. Reddy, N.J. Sai, N. Susheel and K.P. Peeyush, "Autonomous Seed Sowing Agricultural Robot", in IEEE Conference on advances in computing, communications and informatics (ICACCI),2018, pp.2332-2336.

[7] S. Kareemulla, E. Prajwal, B. Sujeshkumar, B. Mahesh, and V Reddy, "GPS based Autonomous Agriculture Robot", IEEE International conference on design innovations for 3Cs compute communicate control, 2018, pp.100-105.

[8] Ranjitha B., Nikhitha M. N. and Aruna K, "Solar Powered Autonomous Multipurpose Agricultural Robot Using Bluetooth/Android App", IEEE Conference on Electronics Communication and Aerospace Technology [ICECA], June 2019, pp.872-877.

[9] B. S. Shivprasad, M. N. Ravishankara, B. N. Shoba, "Design and Implementation of Seeding and Fertilizing Agricultural Robot", International Journal of Application or Innovation Engineering and Management(IJAIEM), Volume 3, Issue6, June 2014.

[10] S. Konam, N. Srinivasa Rao and K. Mohan Krishna, "Design encompassing mechanical aspects of ROTAAI: Robot to aid agricultural industry", in IEEE International conference on soft computing and machine intelligence, 2014, pp.15- 19.

[11] C.M. Barber, R.J. Shucksmith, B.M. Donald and B.C Wunsche, "Sketch-based robot programming," in IEEE International conference of image and vision computing newzealand, 2010, pp. 1-8.

[12] N.S. Naik, V.V.Shete and S.R.Danve, "Precision agricultural robot for seed function", in IEEE International conference on inventive computational technologies (ICICT), 2016, pp.15-19.

[13] P.V. Santhi, N. Kapileshwae, V. K. R. Chenchela and C. H. V. S. Prasad, "Sensor and vision based autonomous agribot for sowing seeds", in IEEE International conference on energy communication, data analysis and soft computing (ICECDS), 2017, pp. 242-245.

[14] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.

[15] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.

[16] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.

[17] Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.

[18] G.Neelakrishnan, P.Iraianbu, T.Abishek, G.Rajesh, S.Vignesh, "IOT Based Monitoring in Agricultural" International Journal of Innovative Research in Science, Engineering and Technology, March 2020, Volume 9, Issue 3, pp:814-819

[19] G.Neelakrishnan, R.S.Jeevitha, P.Srinisha, S.Kowsalya, S.Dhivya, "Smart Gas Level Monitoring, Booking and Gas Leakage Detector over IOT" International Journal of Innovative Research in Science, Engineering and Technology, March 2020, Volume 9, Issue 3, pp: 825-836