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Solar Powered Autonomous Multipurpose Agricultural Robot Using Bluetooth

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Abstract: In India nearly about 70 percentage of people are depending on agriculture. Numerous operations are performed in the agricultural field like seed sowing, grass cutting, ploughing etc. The present methods of seed sowing, pesticide spraying and grass cutting are difficult. The equipment's used for above actions are expensive and inconvenient to handle. So the agricultural system in India should be encouraged by developing a system which will reduce the man power and time. This work aims to design, develop and design of the robot which can sow the seeds, cut the grass and spray the pesticides, this whole system is powered by solar energy. The designed robot gets energy from solar panel and is operated using Bluetooth/Android App which sends the signals to the robot for required mechanisms and movement of the robot. This increases the efficiency of seed sowing, pesticide spraying and grass cutting and also reduces the problem encountered in manual planting

Keywords: Agriculture, autonomous, grass cutting, pesticide spraying, robot, seed sowing, solar powered

I. Introduction

The history of agriculture spans thousands of years, and various climatic conditions, cultural traditions, and technological advancements influenced and shaped its growth. The agricultural system therefore should be improved to lessen the farmers' labor. The model created to mechanically plant seeds and spray Using pesticides and cutting the grass. The prototype is an example of modern technology for enhancing agricultural processes, including planting seeds, trimming grass, and applying pesticides based on robotic support.

The document is structured in the manner described below. Section II displays comparable works that have already been published. The suggested layout of Section III introduces a versatile agricultural robot. Section IV talks about how the algorithm is put into practice. In Discussion of the work's prototype results from Section V. In The work on Section VI is complete.

II. Proposed system

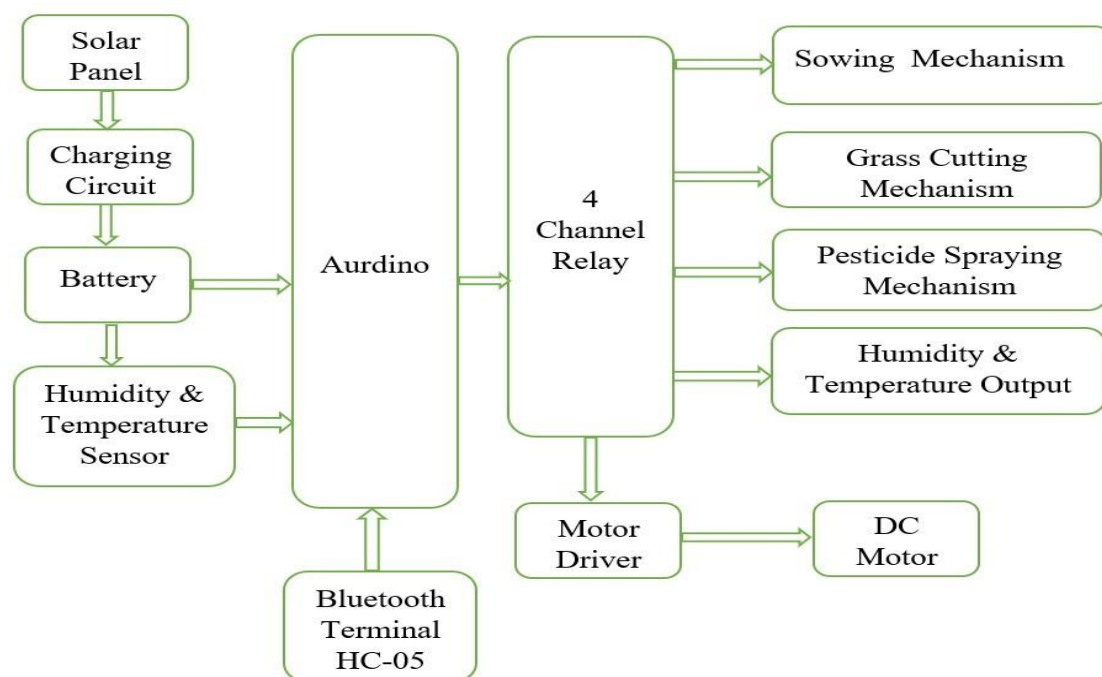


Fig.1. Block diagram of the Automated Seed Sowing, Grass Cutting and Pesticide Sprayer Robot Using Bluetooth

The block diagram includes an Arduino microcontroller that serves as the overall system's controller. A solar panel is connected to the battery to store energy, and it is also given to a power supply charging circuitry that supplies +5 V to the Arduino board and +12 V to drive DC motors with L298 motor driver modules.

To control the entire system, Bluetooth HC05 is connected to an Arduino board and wirelessly to an Android smartphone.

A. Arduino Microcontroller (AT mega 328)

The different components are controlled by an Arduino Atmega328 microcontroller depicts the architecture of the Arduino atmega328 microcontroller. There are 28 pins on the Atmega328 microcontroller. It features 13 digital I/O pins, 5 of which are analogue input pins and 5 of which are PWM output pins.

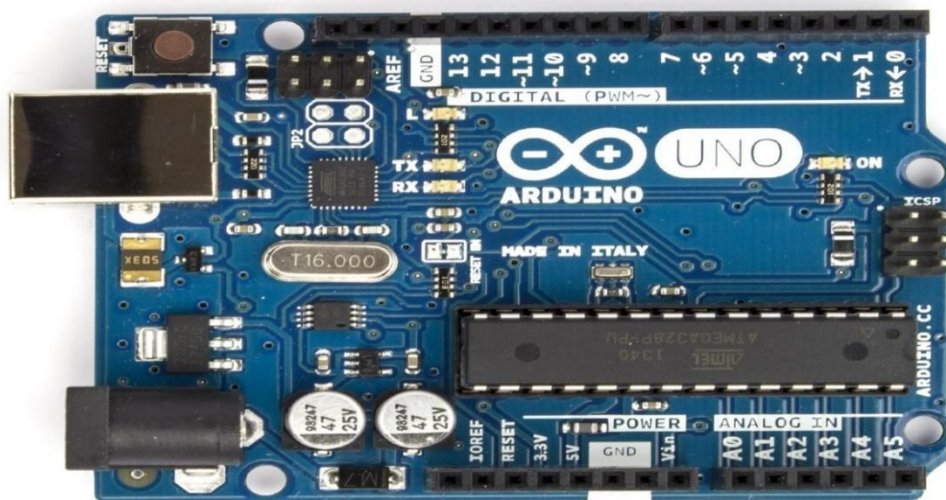
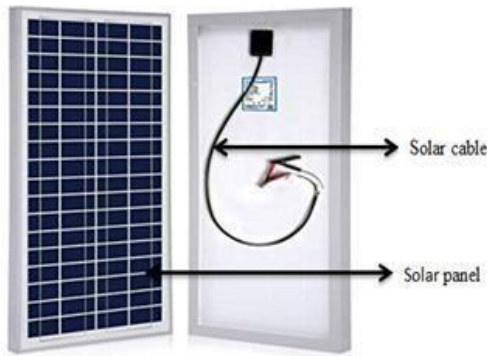


Fig.2. Architecture of Arduino Atmega328 microcontroller

B. Solar Panel

Photo voltaic (PV) cells, as depicted in Fig. 3, are solar cells that are used in calculators and spacecraft. As the name suggests (photo means "light" and voltaic means "electricity"), PV cells convert solar energy directly into electricity. A module is a collection of electrically connected cells that are crammed into a frame (most frequently referred to as a solar panel). Everyone wants to be self-sufficient or at least lessen the carbon imprint of their home, and solar panels make this dream a reality. Solar panels are a terrific way to lower your electricity usage. Photovoltaic (PV) cells are used in solar panels to turn sunlight into electricity.



C. Bluetooth Module HC-05

The Bluetooth Serial Port Protocol (SPP) module and the HC05 module are both made for straightforward wireless serial connection setup. The HC-05 Bluetooth module, which is depicted in Fig. 4, can be used to connect with any Bluetooth-enabled device, including a phone or laptop, as well as two microcontrollers like the Arduino.

Bluetooth HC05 is wirelessly connected to the Arduino and an Android smartphone in order to control the complete system. Because the HC05 module utilizes the SPP to function, pairing it with microcontrollers is fairly simple.

D. Motor Driver IC L293D

The motor driver is a motor module that enables simultaneous control of two motors' working speed and direction. Based on the L293D IC, the motor driver was created and developed. According to Fig. 5, the L293D is a 16-pin motor driver IC. At voltages ranging from 5 V to 36 V, it offers bidirectional drive currents. The L293D is an IC that can simultaneously operate two DC motors with eight pins on each side. Each motor has two enable pins, four output pins, and four input pins.



E. Relay

As seen in Fig. 6, a relay is a switch that is electrically actuated. It utilizes an electromagnet to function mechanically as a switch, but it also makes use of other working concepts, such as solid-state relays. A circuit can be controlled by a relay using either a separate low-power signal or a single signal that controls several circuits. In early computers and telephone exchanges, relays were widely utilized to carry out logical operation.

III. . IMPLEMENTATION OF ALGORITHM

The algorithm for the automated robot that uses a Bluetooth/android app to spray pesticides, trim grass, and sow seeds is shown in the flow chart . The robot's algorithm is as follows:

Step 1: Begin

Step 2: Turning the robot on

Step 3: Connecting the mobile phone and Bluetooth device

Robot in step four must wait till it receives a signal from the application.

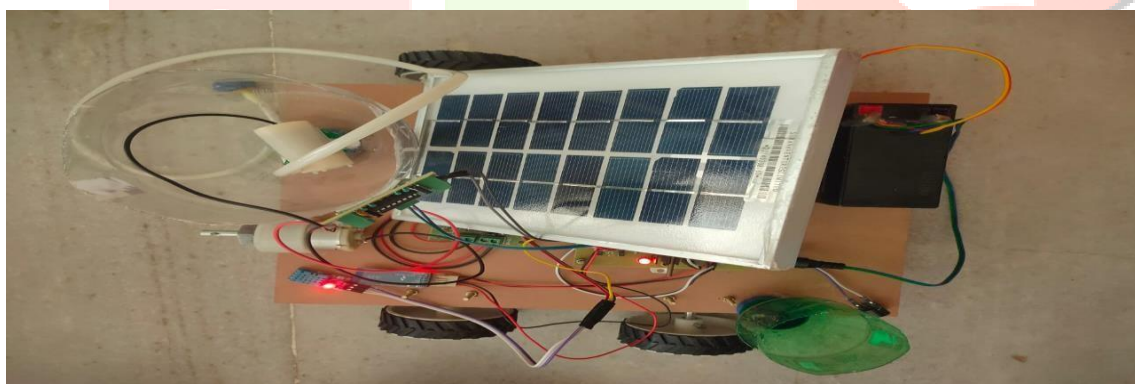
Step 5: The robot responds to the signal if it is received.

Step 6: Proceed to step 4 if the signal is not received.

Step 7: To disable, use the global OFF signal.

V. RESULTS AND DISCUSSION:

The planned robot will simultaneously carry out the tasks of seeding, applying pesticides, and cutting the grass. Heat from the solar panel turns sunlight into power. The charging circuit receives this electrical energy. In order to provide pulsed voltage and prevent reverse current, the charging circuit will operate in accordance with the maximum power point tracking (MPPT) protocol. To charge the battery, the pulsed voltage is applied. Voltage sensors are used to manage the battery's charge. Due to its bidirectionality, the battery can charge and supply voltage to the Arduino simultaneously. High pass filtering is used to feed the voltage source with continuous oscillation into Arduino. All separate mechanisms receive voltage feed via the channel relay. The DC motors that power the robot are driven by the motor driver.



VII. CONCLUSION

To carry out difficult farming activities including seed sowing, grass cutting, and pesticide spraying, an autonomous multipurpose agricultural robot is created. Two different sized seeds are to be sown using this work. Reduced human interaction and effective resource use are two advantages of robots. Bluetooth is used to communicate instructions to the system, ensuring that no direct human touch occurs and guaranteeing the operator's safety. Since the robot is solar-powered, renewable energy is being used. Android apps are used to carry out the tasks. Innovative equipment for grass cutting, spraying pesticides, and spreading seeds has a big impact on agriculture. Farmers can save a lot of money on labour and more time by adopting this advanced job.

VIII REFERENCE

- [1] S. Umkar and A. Karwankar , "Automated Seed Sowing Agribot using Arduino," in *IEEE Conference on Communication and Signal Processing*, April 2016, pp.

