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### Automated Grasscutter Operated by Bluetooth using Arduino

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#### Abstract

In today's time the concept of robots is seen as a way to reduce human efforts and increase productivity without compromising on quality and accuracy of the work. This project considers the implementation of a robot that can be operated wirelessly using Bluetooth Technology. Integrating hardware and software is the key to this project. By integrating hardware and software, we found just how much technology can be used to develop an outstanding project. The project was done in two different stages. In the first stage, the programming of the wireless control of the arduino and interfacing it with Bluetooth application. The second stage of our project was creating an Autonomous Lawn Mower. This describes different aspects (Technical and Non-Technical) of the lawnmower.

Keywords- Solar panel, Arduino Nano, Motor driver

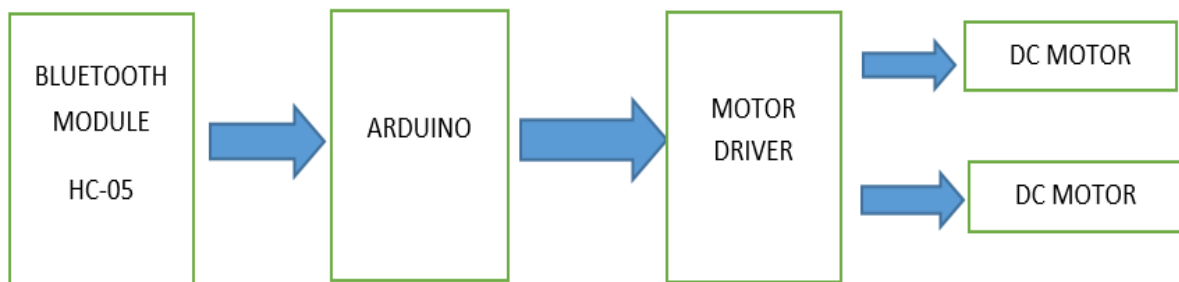
#### 1.Introduction

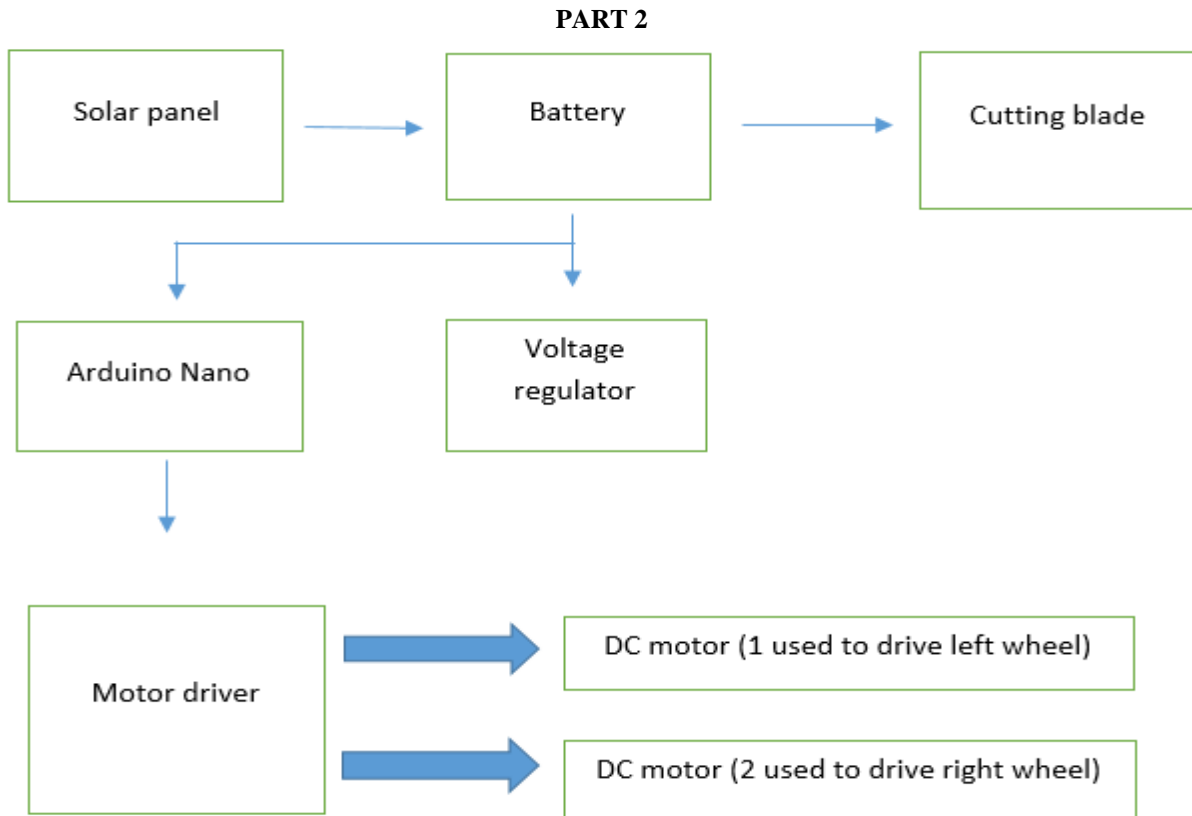
The main purpose of this project is to develop a remote user interface to control a robot via wireless technology. There is a need to communicate with the robot remotely to control the robot movements and pass critical data both ways. Bluetooth communication will allow us to manage the robot maximum 10 meters without the use of direct vision that means that the robot could be situated behind a wall or some other object and the communication would not be a loss. Mow the garden with a standard motor-powered lawn mower is a difficulty and no one takes pleasure in it. Cutting grass cannot be easily accomplished by the elderly, younger, or disabled people. So the objective of our project is to design a robot that will enable human beings to perform a tedious job easily. As the name of the project suggests the robot will be used to cut down the grass in the lawn but in this case there is no need for us to shift an inch from our place to run the cutter above the lawn. This prototype will be automatic and will run on a charged battery with no cords to interfere with the operation and also solar energy can be used in place of a battery. This cordless electric lawn mower is based on the Bluetooth pairing capability which is less expensive than a robotic lawnmower. This self-propelling lawnmower design is comprised of Bluetooth communication and autonomous capability that is user friendly so most consumers will be able to use this device. It is safe to use, as well as efficient because it is electric powered and cordless.

#### 2.Related Work

The solar lawnmower is automated by grass cutting robot powered by solar energy. The 12V batteries system are used to power bot movement motor as well as a grass cutter. Relays help for high power to a low power supply. The various actions are decided by the brain which is Arduino Nano. We use a solar panel to charge the battery there is no need charging it externally. The grass cutter and bot motors are interfaced with Arduino Nano that is controlled by Bluetooth module. We use two dummy wheels in front side and two motors are connected in the backside. The motor driver helps to movement are right, left, forward, backwards controlled by Bluetooth system. The motor movements run at 60 pm and the blade motors run at 1000 rpm. The ground clearance of the bot is 2 inches

#### 3.Block Diagram of System PART 1





#### 4.Components

##### A) Arduino Nano-

Arduino NANO is capability to perform in small form factor programming language is used for Arduino popular in high level. It is similar to Arduino UNO.

##### Technical specification-

Microcontroller – Atmega328

Architecture – AVR

Operating voltage – 5V

Flash memory – 32kb

Clock speed – 16MHz

PCB size – 18x45 mm

PCB weight – 7 grams

##### B) HC-05 Bluetooth Module:

Bluetooth controlled mower requires to touch button in android phone to manage the robot in forward, backward, left, and right directions. So here android phone is used as a transmitting device and the Bluetooth module placed in the car is used as a receiver. Android mobile phones will transfer command to the robot using its in-built Bluetooth to shift in the required direction like moving forward, reverse, turning left, turning right, and stop. HC Bluetooth module consists of two things one is Bluetooth serial interface module and a Bluetooth adaptor. Bluetooth serial module is used for converting the serial port to Bluetooth. Bluetooth module has two modes one is the master mode and the second one is slave mode. Users can set either mode by using some AT commands. Even users can set the module's setting by using the AT command.

Bluetooth Module has 6 pins:

1. Key uses to bring Bluetooth module in AT commands mode.

If the Key/EN pin is set to high, then this module will work in command mode. Otherwise by default it is in data mode.

The default baud rate of HC-05 in command mode and data mode is 38400 bps and 9600 bps.

Two modes, HC-05 module are: -

1.1) Data mode: Interchange of data between devices. 1.2.) Command mode: It uses AT commands which are used to change the setting of HC-05. To send these commands to the module serial (USART) port is used. 2.) VCC: Pin-Connected by 5 V or 3.3 V. 3.) GND: Ground pin of the module. 4.) TXD: Transmit Serial data. 5.) RXD: Receive data serially. 6.) RESET: It tells whether the module is connected or not.

1.2) To communicate smartphones with the HC-05 Bluetooth module, a smartphone requires Bluetooth terminal application for transmitting and receiving data. You can search Bluetooth terminal applications for android and windows in respective app. store.

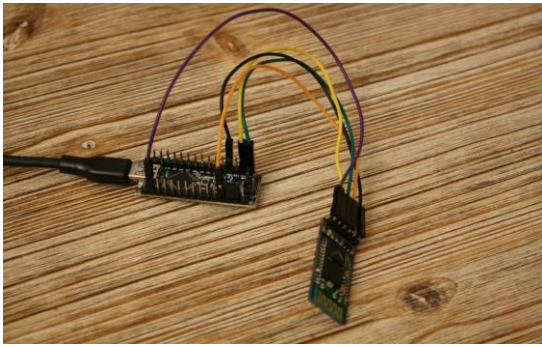


Figure – 1 Bluetooth module and Arduino Nano

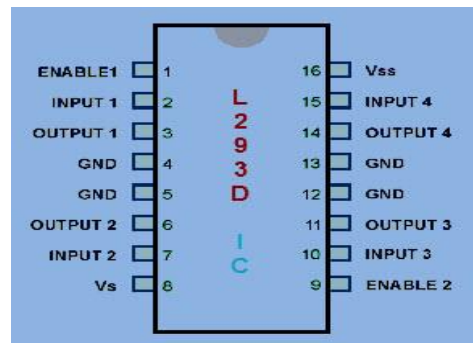


Figure- 2 L293D Motor Driver

**c) L293D Motor Driver:** a typical Motor Driver IC that allows to drive in any direction. It is consisting of 16-pins which are used to control a set of two DC motors instantaneously. This IC can drive small and quiet big motors. This L293D IC works on the fundamental principle of H-bridge, this Motor control circuit which allows the voltage to flow in any direction. As we know that the voltage must change the direction of being able to rotate the DC motor in both directions.

**D) DC motors -** Switch the motor on and off can be very quick. If switching is fast, it does not effect the motor.

#### Technical specifications-

Operating voltage – 12V

Operating current- 80mA

Rpm -60 , Rpm – 1000

**E) Relay Box -** It works as a voltage regulator for the circuit. It is an important part because we have used a 12v battery and Arduino has a maximum input of 5v. Logically using higher input can damage the ARDUINO.

**F) Cutter -** It is made up of a stainless steel blade and wood. It is a very basic design cutter. In which two blades are fixed at the end of wood which is then mounted on the shaft of the 1000 RPM motor.

### 5. Calculation And Results

The capacity of the battery – 2000mAh, discharging current – 1.2amps, the output of the solar panel – 12v and 5v. the discharging time is 2 hours approx. Using the formula  $E = VIT$ , we calculated the charging time – 4 and half hour.

### 6. Conculsion

With the safe, reliable, cheap, and user-friendly Bluetooth controlled lawnmower, the Robotic Lawn Mower would be a must-have item in every household as it is Time Efficient and requires very few efforts on the field. That is why along with the various ages of users, this lawnmower can also be used by people who have disabilities and are unable to use a regular push, or riding lawnmower. Due to this it will create employment opportunities for physically disabled peoples and aged persons too. Also, this project will help farmers time. Further modification can be made so that it can also be used as a surveillance robot.

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