

## Solar Gardenbot

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**Abstract:** In this project we have studied the importance of solar energy and converted the solar energy to electrical energy in order to drive our project. We also studied the working of wireless transmission and reception with the help of HC-12 wireless module. And studied the working of 8051 microcontroller with solar panel, battery, 7805 voltage regulator, push buttons, hc-12 module, mosfet switch, motors and L293D motor driver. Thus this makes our project eco friendly, less time consuming and less human efforts.

**Keywords:** Objective, Working, Project implementation, Applications, Advantages

### I. Introduction

In the time where technology is merging with environment awareness, consumers are looking for ways to contribute to the relief of their own carbon footprints. The solar lawn mower is a remote operated grass cutting robotic vehicle powered by solar energy and is capable of automatic grass cutting, floor cleaning and watering plants with the help of remote which is controlled by human. The system is operated by using 12V batteries to power the vehicle movement motors as well as the grass cutter motor. A solar panel is used to charge the battery. The vehicle motor, floor cleaner motor, grass cutter motor and pump are interfaced to an 8051 microcontroller via mosfet switches that control the working of all the motors. This project of electromechanical system for outdoor, indoor applications will reduce both noise and environmental pollution. This design is meant to be an alternate green option to the popular and environmentally hazardous gas powered lawn mower. Further we can use it for gardening purpose for watering plant, also it can be used as a carrier for transporting objects.

### II. Components Used

**Solar panel-** We are using 12V polycrystalline solar panel. Solar panel is used to convert solar rays to electrical energy. Solar panel generates DC electricity when solar rays are incident on it due to the photovoltaic effect.



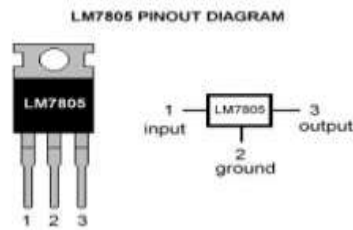
Fig. 1 12V Solar panel

**Battery-** Lead acid battery. This battery is of 12V and it stores electrical energy of 12V from the solar panel. With the help of this battery, we are driving our Gardenbot components.



Fig. 2 12V Battery

7805 Voltage Regulator- 8051 microcontroller requires 5V but we have 12V in order to convert 12V to 5V we use 7805 voltage regulator it basically reduces the voltage from 12V to 5V.



**Fig. 3** 7805 voltage regulator

8051 microcontroller-We are using AT89C51 microcontroller which is 8 bit microcontroller which uses less power and better performance, This microcontroller is interfaced with push buttons, Hc-12 module, mosfet switches and motors. It has four bidirectional ports. It is a 40 pin ic.



**Fig. 4** 8051 microcontroller

HC-12 wireless module-This is new wireless embedded module with communication distance of 1000m, it has frequency band 433.4-473 Mhz with transmitting power of 100mW.



**Fig. 5** HC-12 module

L293D-This is a motor driver ic which consist of two H bridge circuit and used for controlling the movement of motors either forward, backward, left or right. It acts like a current amplifier it takes low current signal and provides high current signals to motors.



**Fig. 6** L293D

Mosfet as switch-We are using three mosfet switches to control the switching of pump, grass cutting motor and floor cleaning motor. mosfet is three terminal device with source, drain and gate. We are using irf 540N



**Fig. 7** Mosfet as switch (irf540n)

Dc Motors-This project uses four 20rpm motors which is controlled by L293D ic for forward,backward,left,right movement, uses one 18000rpm motor for grass cutting and one60rpm motor for floor cleaning. The mechanism of grass cutting and floor cleaning completely depends on speed of motors.



Fig. 8 DC Motors

Pump-This project uses 3-6V pump, pump will suck water and then it release water with the help of pipe this action is controlled by 8051 microcontroller via mosfet switch.



Fig. 9 Water pump

10k pull up resistors-Pull up resistors are used when we use switches.the function of pull up resistor is to read high input when we don't press the button.



Fig. 10 10k pull up resistor

### III. Block Diagrams

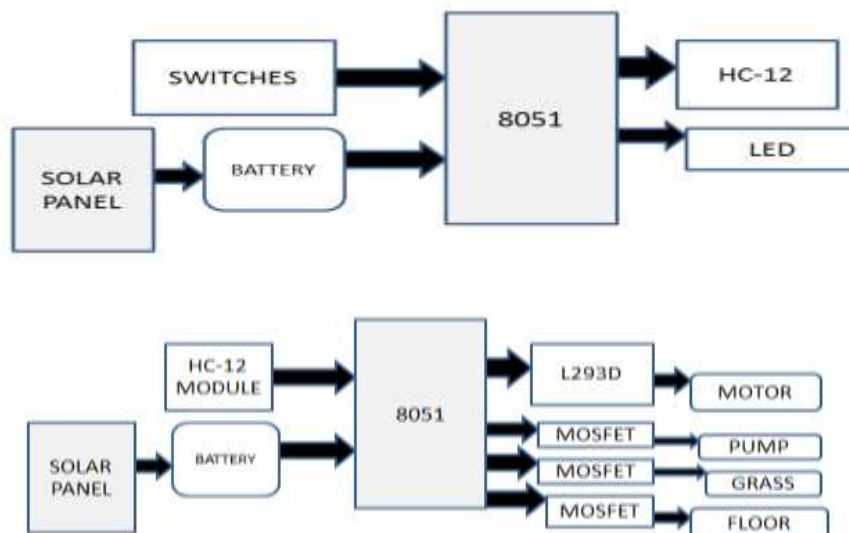


Fig. 11 Transmitter and Receiver

#### IV. Circuit Diagrams

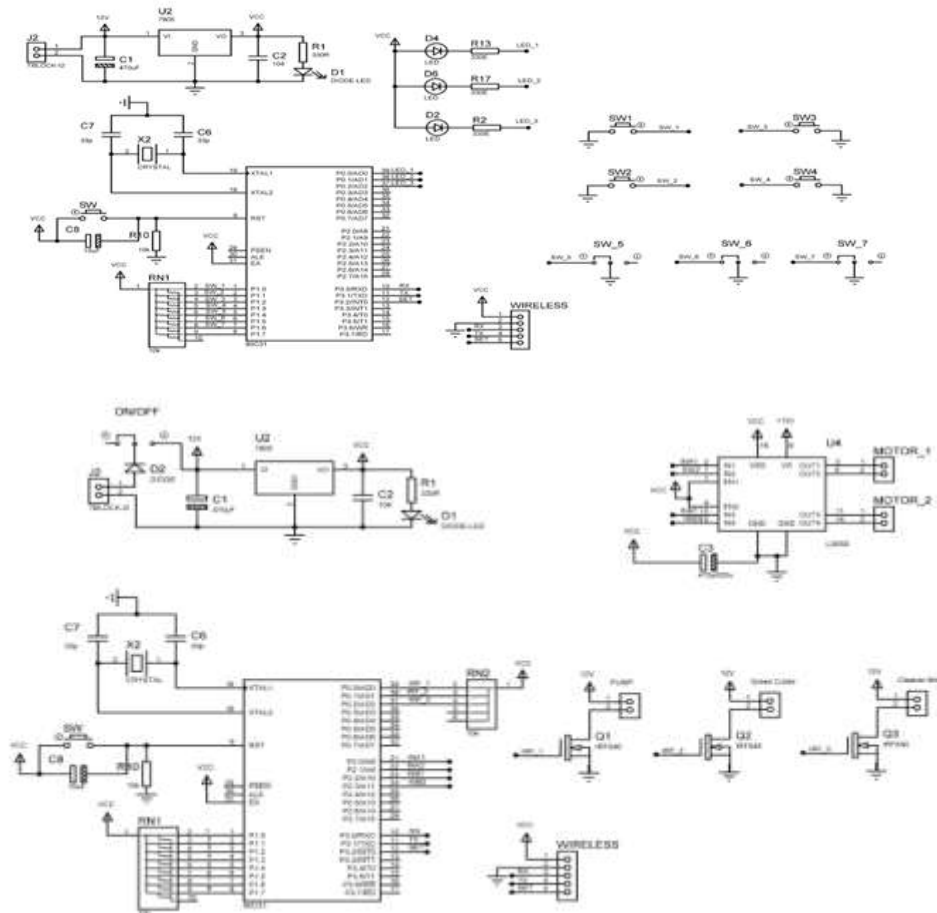


Fig. 12 Transmitter and receiver

#### V. Working

Remote working- We are using 8051 microcontroller which will be interfaced with hc-12 wireless module ,switches and leds.7805 voltage regulator is use to convert voltage from 12v to 5v which will be given to 8051uC to power the controller. We use push buttons for forward, backward ,left, right movement which is control by 8051 programming. And we use slide switch for on/off action of grass cutter, floor cleaner and pump.This actions will be transmitted by hc-12 module to the receiving project model.

Project model working-The signals transmitted by remote is received by hc-12 module on receiver side and depending on the input given we get desied output.If input is for grass cutting then grass cutting motor will start via mosfet switching which is programmed using 8051 micro controller and same actions are carried for floor cleaning and pump.on receiver side we are using L293D motor driving ic for controlling the movement of motors ,ic is interfaced to 8051uC.Programming of 8051 microcontroller is done using Keil Software.

#### VI. Project Implementation

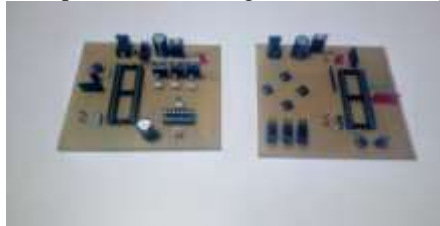
Pcb etching –By using proteus software we constructed circuit diagram for solar gardenbot along with this we build layout of our circuit diagram using same software and then took print of layout on photo paper using laser printer.Then placed that photo paper with layout on plain copper board and then iron the photo paper with proper temperature.

Then soak the board in water for 25 min ,clean the unwanted thing and again place the board in ferric chloride solution and then clean the surface using acetone thus our pcb will be ready.



**Fig. 13** Pcb etching

Components soldering-Soldered the components according to the circuit diagram.



**Fig. 14** Components Soldering

### VII.Applications

Grass cutting,Floor Cleaning,Plant watering,As a carrier for transporting objects from one place to another.

### VIII. Future Scope

Instead of using remote we can control it using cell phones that can be done using Bluetooth module(HC-05) by Bluetooth terminal app.Further we can increase the application like scrap collecting,soil moisture detecting.Also we can make our bot automatic by using ultrasonic sensor and accelerometer.

### IX. Conclusion

Thus we have implemented solar gardenbot which is durable,ecofriendly,less maintainance and portable.It is a multipurpose machine that does not require fuel.

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