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IOT based solar powered Grass cutting machine with Bluetooth remote controlling App and height adjustment mechanism using microcontroller

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Abstract - *The main purpose of this project is to design a grass cutting machine system which makes the grass cutting will very easy and more convenient. The IOT based solar powered grass cutting machine is one of the robotic vehicle. It is operated on battery and battery is energies by solar panel. This system requires 12 volt battery for giving power to robotic vehicle movement as well as grass cutter motor. The working principle of grass cutter and machine motor is completely controlled by microcontroller. It controls working of all motors. We can handle movement of vehicle motor with the help of microcontroller. In this project we are using Bluetooth technology for controlling the robotic vehicle. The Bluetooth handled by Android smartphone application. IOT is one of the important technology. This technology is used in our project for checking the battery condition.*

***Key Words*: Microcontroller, Bluetooth, IOT, Solar Power, DC Motor.**

1. INTRODUCTION

Nowadays, grass cutting machine becomes a very popular in urban India. This machine is most commonly used for furnishing the grass. DC motor, drivers circuits for controlling motors, battery, solar panel, blades, etc. are the some main parts of our project. It is placed in a suitable structure in our project. The motors are connected to the electric supply by using wires. The linear cutter blades are attached to the motor. 'Providing a high speed rotation to the blades, it helps to cut the grass' is main working principle of Grass cutter. Whenever increasing the rpm that time the blade will get kinetic energy and cut the grass. The cutting edges of the cutter are very smooth and accurate.

The grass cutting machine is very easy to use in lawn, gardens and grass fields. For increasing the beauty of home lawns and gardens, grass cutting machine is the best option. In our project, rotating blades are cutting lawns, gardens at even length. Hence people can able to easily maintain beauty of their lawns, gardens.

Solar energy is one of the renewable energy. This renewable energy is produced by the sun and it is available in free of cost. We are using this solar power in our project. With the help of solar panel, we convert sunlight into electricity. This electricity is stored in the batteries. Battery is one of the main part in our project. With the help of this, we can able to use grass cutting Machine at any time.

Solar grass cutter has very less moving parts. Due to this it requires less maintenance and no major drawbacks. Our Grass cutting machine does not cause any environmental pollution such like fossil fuel, nuclear power. Nowadays, IOT technology is widely used in the industry. It is advance technology. This technology we are used in our project for monitor and display the data using the Wi-Fi internet connection. For displaying the data, we are using LED display. Wireless Bluetooth technology is used to controlling the machine. We operate the grass cutter machine by Bluetooth robot controls apps. This app is available on Android play store.

2. LITERATURE REVIEW

Sivarao, T.J.S.Anand, Hambali, Minhat, Faizul[1] presented a review of researches done on the subject of automated tractor. An autonomous tractor is a vehicle that can operate without or with minimal human control, self-propelled and guided automatically along a desired path. The benefits from such a system are useful for agriculture industry by reducing labour cost and time, as well as improving output efficiency by eliminating human errors.

Pratik Patil, Ashwini Bhosale, Prof. Sheetal Jagtap[2] described about an automatic lawn cutter that will help the user to cut the grass in their lawn with less efforts. The different sensors are used it will detect and avoid objects and humans while mowing. The main objective of this automatic lawn cutter is that the user can specify the area that is to be mown and also the height of grass as per there requirement by using the keypad. This design contains a microcontroller like ATmega 16, multiple sensors, LCD Display, Keypad.

Ernest L. Hall [3] The system operates on the same principle as the Lawn Ranger except it uses a cable beneath the surface of a persons lawn. The mower uses this wire

along with its sensors to allow the robot to maneuver around while keeping the system on track. The mower will continue to operate as long as the mower has energy, from the sun. The robot is equipped with a flexible bu mper that when activated backs the mower up and continues the robot on a different path. It has the advantage of cutting grass in the form of a mulch so that the use of a grass catcher or raking is not required.

3. THE OBJECTIVE OF PROJECT

The specific objective of this project was

1. To develop an automatic grass cutting robot this would be able to help users in cutting the grass in gardens.
2. The robot was made able to cover all the area of flat land.
3. It was also considered that it should be moderately cheap and easy to implement with the help of the microcontroller.
4. Instead of requiring small details to be specified, the task in this project was carried out by considering the essential design features so that the system was able to autonomously execute its job in a manner that satisfies its desired task.
5. The user should be able to operate this robot from a distance of 20feet. Grass height should me variable depending on the user's choice.
6. The user should also decide the cutting height and adjust it accordingly.

4. COMPONENTS

4.1. Microcontroller AT89C52

Figure -Microcontroller AT89C52

The AT89C52 is an 8bit microcontroller with 8k bytes flash. Number of interrupts is 8. The AT89C52 has 40 pins. The Atmel AT89C52 is a powerful microcontroller which provides high flexible. It is a cost-effective solution to many embedded control applications.

4.2. Motor Driver IC- L298

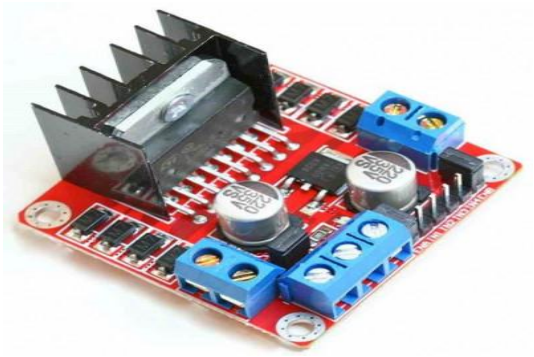

Figure -Motor Driver IC- L298

This device works on dual H-bridge motor driver which allows speed and direction control of two DC motors at the same time.

4.3. WIFI Module- ESP8266

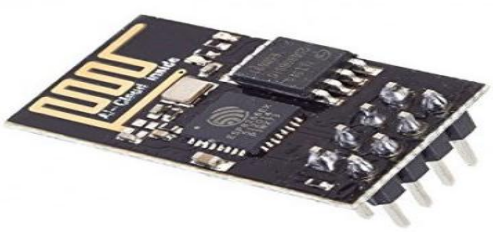

Figure -WIFI Module- ESP8266

ESP8266 is a low pass Wi-Fi module through this the microcontroller can connect via Wi-Fi.

The use of ESP8266 module is send data to a website and receives data from a website. Through ESP8266 module we can communicate with one microcontroller with another microcontroller via Wi-Fi.

4.4. Bluetooth Module- HC05

Figure -Bluetooth Module- HC05

This HC-05 Bluetooth Module helps to send data from android application to the microcontroller over the wireless

Bluetooth connection. Main use of this Bluetooth is controlling the motors.

4.5. DC Motor

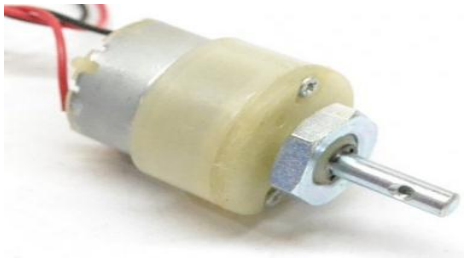

Figure -DC Motor

Here in our grass cutting robot, 4 wheels are driven by the 4 DC motors and another 2 DC motors for cutter assembly. The DC motor converts the electric energy into mechanical energy.

4.6. Solar Panel

Figure -Solar Panel

The use of Solar Panel is converting the solar radiation into the electric power using photo voltaic cells.

4.7. Cutter Blades

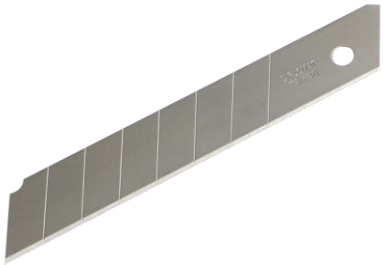

Figure -Cutter Blades

The grass cutting blades are the best for mowing large areas of tough grass. They are made of steel. They are available with a large of different teeth. The design of grass cutting machine is allows it to power through various woody areas. The blades are attached to the motor. And it is controlled by mobile app.

4.8. Battery

Figure -Battery

For this project, we need 12 v batteries to run this project. With the help of solar panel, we charge the battery and stored the energy.

When the cloudy condition occurred in the environment and also solar panel not worked due to sun light is not available that time, we use the battery. With the help of battery, we can able to continuous use this project.

5. BLOCK DIAGRAM

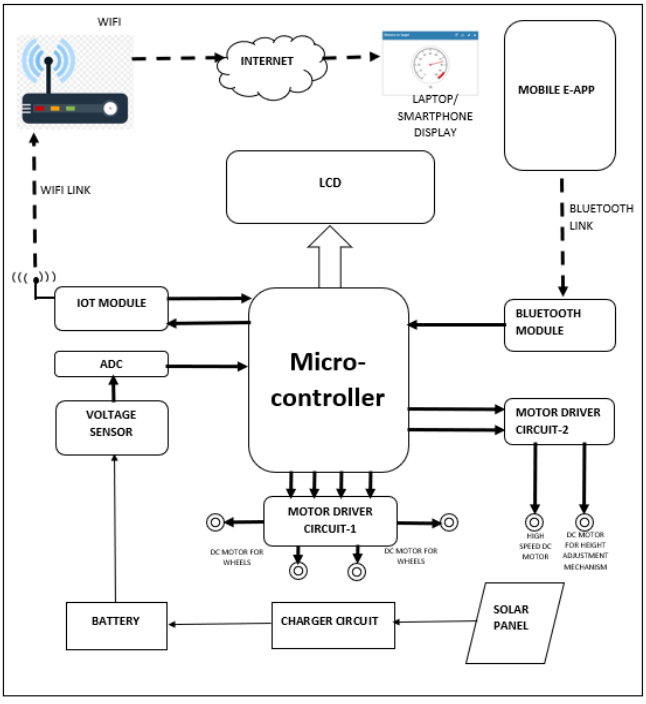

Figure -Block Diagram

6. FLOWCHART

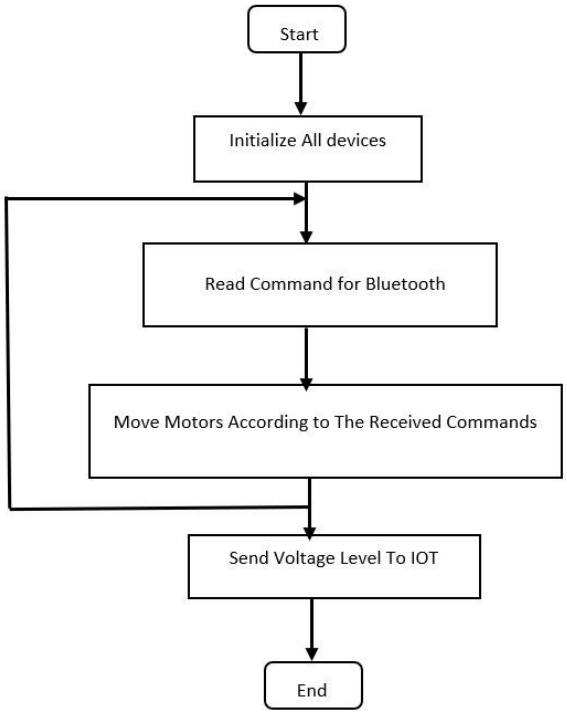

Figure: flow chart

7. WORKING

A grass cutting robot is basically a land moving vehicle with 4 wheels. These 4 wheels are driven by 4 dc motors of low speed. There is another dc motor with high power and high speed which will be used for the cutter assembly. A grass cutting mechanisms will be attached to it. This motor will be relatively low speed. There will be another motor that will be used to set the height of the grass cutting level. This motor is coupled with a rack and pinion mechanism to adjust the height. All the DC motors are 12V-DC motors. The driver circuits will provide the required current for the motors.

The battery used here is a 12V/1.5Ah rechargeable dry battery. This battery power is used to power the machine and to all components. There will also a solar panel that will convert the solar radiation into electrical power using the photo voltaic cells. The solar panel rating is 12V-5W. It will be sufficient to charge the battery during the day time. We can also provide a dc charger for charging the battery when solar power is just not enough, i.e., during conditions.

User will be provided with a remote android mobile which will work on Bluetooth communication. The user can give command to the robot using various keys on the controlling Android App. The functions like forward, reverse, left, right, stop, cutter ON, cutter OFF, height increase and height decrease. The user has to first pair the Bluetooth once and then start controlling the grass cutter.

The use of IOT technology also significant here. It is used to display the battery charging status over the website. There will be a voltage sensor connected to the battery terminals that will sense the battery voltage and give it to the ADC (Analog to Digital Converter) IC. It will convert the analog voltage value into the 8bit digital value for the microcontroller.

The microcontroller we are using here is a 8bit microcontroller. The microcontroller will work according to the program that we write into it. The major function of the controller here is to take data from sensor and display it on the LCD display and to transmit it over that WIFI module. It also receives the signal from the Bluetooth module and send the signal to the motor driver circuit to rotate the motors in appropriate direction at appropriate time.

8. HARDWARE OF PROJECT

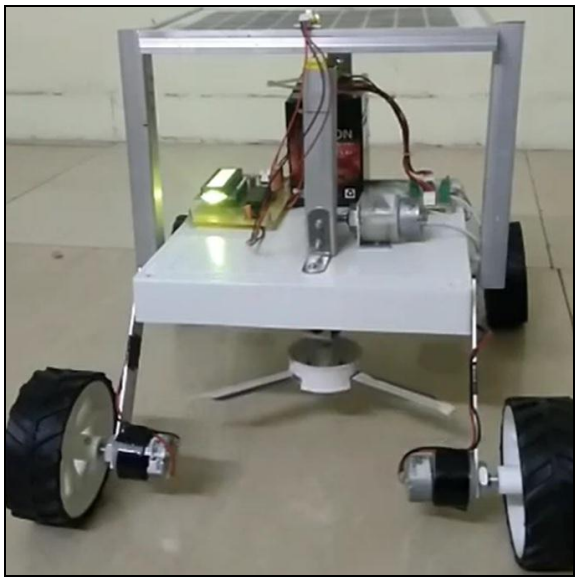

Figure 1: Hardware of Project

9. RESULT

Now a days energy plays an very important role in lot of peoples life. Here the solar panel is used for charging the battery when it gets discharged. Here we can control the grass cutter with the help of Android application so that we can cut the grass in any shape we want and even we can cut the grass without much human effort. For the simulation we have used the proteus version 8.0 & KEIL VERSION 4or5 software in it.

The result before and after of this project is

Figure 2: Before use

Figure 3:After use

10. FUTURE SCOPE

1. The solar panel can be fixed with light sensor, thus depending upon the arrangement of sun; the panel will be slanting such that the sun rays are incident normally at 90degree to the solar panel.
2. If panel used of high watt than the machine can be used during night time for garden lighting.
3. By connecting box type transponder we can also use it to transport file, books other stuffs from one place to another place.
4. We can use camera for capturing the covered area.

11. ADAVANTAGES

1. Easy to move from one place to another place
2. Operating principle is simple
3. Non-skilled person also operate this machine
4. No fuel consumption
5. Compact size and easy to portable.

12. CONCLUSION

Here we get pollution free and hazard free grass cutting machine. Some of the features of this machine is very unique and innovative. The height adjustment feature is really helpful for the user. The Bluetooth control provides remote access to the user. It is equipped it the advanced technology like the IoT. Solar panel makes charging of the battery effortless.

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