IOT BASED SOLAR GRASS CUTTER

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Abstract - *20th century is known for century of full of automation and development. We see day to day life automation become habit of every field like manufacturing industries, automobile industries, farming etc.*

We are introducing IoT based solar grass cutter. IoT is a system of interrelated digital machine mechanical and people that are used to data in efficient way. In IOT based solar cutter, controls are made by smartphone which is become a use of everyone. In this device we used a Arduino software and all the programming is done on it. Ultrasonic sensor detects a problem and DC motor becomes a useful part providing a motion upward or downward. Solar panels become source of solar energy giving the energy to the system. This renewable source of energy is used in summer and other season also.

*Key Words***: IoT(Internet of Things), Solar Panel, Arduino**

1. INTRODUCTION

The basic idea behind the Bluetooth based solar grass cutter is the reduced human efforts and to take another step forward towards the automation by improving all the machines around us from manual usability to automatic use of them.

In the present scenario, where we want to have minimum dependency on renewable resources along with the race of automation, the solar energy acts as an alternate to our modern problems of coping with the limited energy sources available to mankind.

The use of solar grass cutter after connecting it with a Bluetooth controller can be an aid to unskilled persons and so the efforts are needed for the development of such models.

The new idea which we are implementing in this model is usage of an android phone apart from a remote and its compact form allows it for the usage at places where it is difficult for us to make use of previous models of grass cutters.

2. LITERATURE REVIEW

[1] Srishti Jain, Amar Khalore and ShashikantPatil: Designed a robot using solar power which will help the user to cut the grass with minimum effort. Designing part ensures that it is not stay up to lawn area but freely move to anywhere. Sensors were also in built that will make it to move anywhere. The main disadvantage that response time of the system is slow in real time practical situation's.

[2] Ms. Rutuja A. Yadav, Ms. Nayana V. Chavan, Ms. Monika B. Patil, Prof. V .A. Mane: Designed a robot which will have some automation work which erasure human interaction. The system has an infrared sensor which helps to compare between, cut and uncut grass. Thus, the robot continuous until it cut the grass. Obstacle sensors are also inbuilt to get the direction and move freely.

[3] Tushar Baingane: The journey of development made us curious to get everything automated. In modern life , automation is necessary part of invention. A solar grass cutter is a machine that cut grass at an even length with a supervision that uses cutting blades or threads. The main motive is to move the grass cutter in different directions to prepare various designs as per requirement. By using link mechanism, the height of the cut can be adjusted. The unskilled labour can easily operate the device.

[4] Ms. Bhagyashri R. Patil, Mr. Sagar S. Patil:　discussed that human involvement is necessary in every field of working area. The purpose shows to use the solar energy which is renewable form to move the robot with minimal effort of human interaction.

[5] Siddharth Wadhwani, Uday singh, Prakash singh, Shraddha Dwivedi: In the evolution of technology where people deal most of the work with smartphones, can solve their daily life task with it. IT emphasize about use of IoT in various application. It collaborate Arduino which senses the world and IoT which deals with the embedded technologies.
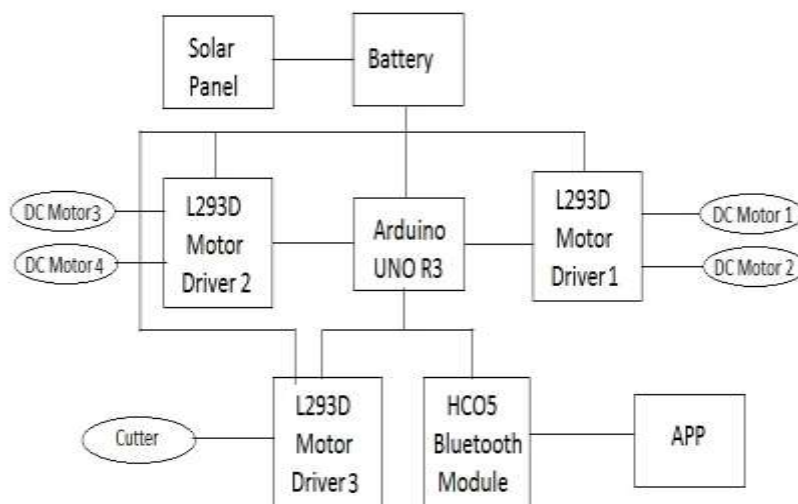
3. WORKING

Fig 1: Block Diagram

In the era of modern world, automation is important. For this, we have design a system which limits the manpower and use minimum energy with minimal effort to cut the grass. Iot links mechanical devices to the digital machines.

System has four wheels, solar panel, battery, Arduino, DC motor, Bluetooth module and the cutter, assembled together to cut the grass. It is operated via mobile phone using Bluetooth app as per the need. Likewise, in the app, 6 keys are used which symbol s

1- ON

2- OFF
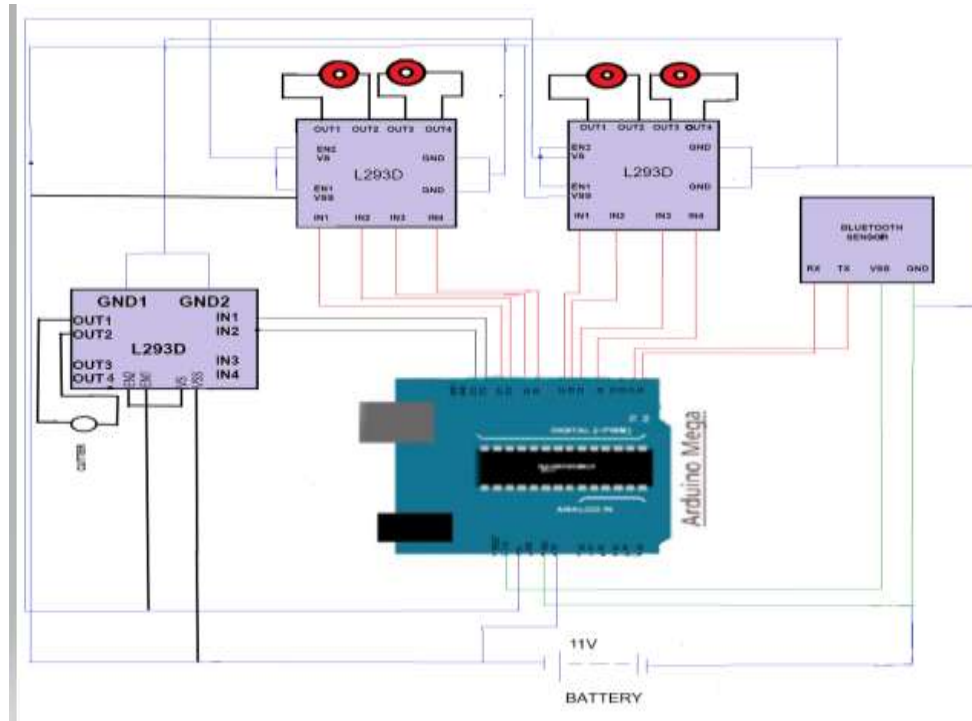
3- Forward

4- Reverse

5- Left

6- Right

Fig 2: Circuit Diagram

When a particular key is pressed, the given instruction is transmitted to the Bluetooth module from the phone over bluetooth connection. Then Arduino receives the signal and performs the operation i.e. appropriate instruction sends to the motor driver input pins.

Solar energy is converted into electrical energy which is stored in the battery. Battery is the power source and Arduino distributes the voltage requirement as per the equipment need.

4. CALCULATION

Assuming battery is fully charged and remains same over its consumption. A11 5 motors are parallel connected with the battery source of 11 volt. A5 voltage is same in the circuit assuming 0.5 A current.

Power=Voltage × Current =11×.5 =5.5Watt

Assuming all this power is consumed in rotating the wheel and the cutter and the power is equally divided.

4.1 Torque in each tyre

TOTAL POWER=5.5W
Power used in each tyre to rotate=5.5/5 =1.1W
AND   P=2ΠNT/60
Where N = No. of Revolution
T= Torque in tyre
P= Power consumed in tyre as per rotor specification
N=500RPM
P=1.1W

$P=2\pi NT/60$

$\Rightarrow 1.1=2\times\pi\times N\times T/60$

$\Rightarrow T=.021$N-m

R= Radius of tyre=1cm= .01m

F= Force acting on wheel to rotate in

$T=F\times R$

$\Rightarrow .021=F\times .01$

$\Rightarrow F=2.1$N

Thus, force acting on each wheel to move the vehicle

4.2 Maximum weight of the body

Taking $\mu=.3$ (μ is the coefficient of friction)

$F=\mu N_r$ (N_r is the Normal Reaction)

$2.1=.3\times N_r$

$N_r=7$N

$N_r=Mg/4$

$\Rightarrow 7=M\times 9.81/4$

$\Rightarrow M=2.85$ kg

Maximum weight of the body as well as assembly is 2.85 kg

4.3 Power used in rotating the cutter and calculating the torque required

Power used in rotating the cutter = 5.5/5=1.1W

N= no. of revolution of cutter per minute = 5000rpm

$P=2\pi NT/60$

$\Rightarrow 1.1=2\pi\times 5000\times T/60$

$\Rightarrow T=.0021$N-m

Maximum force acting on cutter to cut the grass

Radius of cutter=1cm=.01m

Maximum force will act at outer periphery of the cutter.

$T=F(max)\times R$

$\Rightarrow .0021=f (max)\times .01$

$\Rightarrow F (max)=.21$N

5. COMPONENTS

Following are the main components of our Bluetooth controlled solar cutter:-

1) **Arduino Uno R3**: R3 is the latest version of Arduino UNO which we are using in our cutter. Recommended input voltage for this device lies between 7 to 12 voltage and limit is 6 to 20 voltage.

The function of Arduino UNO in are machines to receive signals from Bluetooth module and to control the things based on the coding which are loaded onto you from the Arduino computer programmes which can be operated very easily. It has 20 digital input and output pins for proper connection with other devices like l293d motor driver and IR sensor etc.

2) **L293d DC motor driver**: This device is the link between the microcontroller board and DC servo motors data being used in the cutter for various purposes. It

Basically works on the concept of H- Bridge which allows the voltage flow in clockwise and anticlockwise direction and thus rotates the DC motors in either direction. It also controls the speed of motors.

Operating voltage of Arduino is generally 5 V and motors require more than this i.e. 6-12 V, hence l293d also plays an important role you supply voltage/current from microprocessor to servo motors.

3) **HC05 Bluetooth module**: The HC05 Bluetooth module helps in transfer signals from android application to the microcontroller over the bluetooth connection.

Main motive of this Bluetooth module is to control servo motor being used in cutter with the help of Smartphone over Bluetooth connection. The power supply for the module is +3.3 V and 50mA.

4) **Solar panel**: The solar panel that we are using in our solar grass cutter is a polycrystalline solar module.

Solar panel works on the principle of photovoltaic effect. When the photons strike the surface of panel, the photovoltaics else inside solar cells convert the heat energy into electrical energy and this energy is collected in the battery and can be utilised as energy source for grass cutter.

5) **DC motors**: Here in our machine, we are using 5 servo motors. Four of them are for the four wheels mini motor is used for rotating cutters with approximate speed of 500 revolutions per minute.

It is the motor which is responsible for providing torque to the wheels for smooth and swift rotation and translation of the cutter.

6) **Battery**: It stores the electrical energy converted from solar energy with the help of solar panel fitted into the device. The capacity of the battery being used in the cutter is 12V/1.3AH.

6. CONCLUSION

Bluetooth based solar grass cutter is the machine which not only make good uses of IOT but also based on the need of current scenario that is to minimize the dependency on renewable sources of energy. It fulfills the dual purpose of reducing human efforts as well as the use of energy source which is available in abundance.

Not only skilled but unskilled persons can also operate the device easily using an application in mobile phones and can control it in simple touch.

Apart from fulfilling the basic job, this model is meant to be an alternate green option to the present available machines.

In a nutshell, it is an economical method as compared to an existing method if it is produced on large scale. Also it provides flexibility to the user controlling it.

7. FUTURE REFERENCE

The modification that can be done in future in this model is to implant sensors along with the camera and with the use of artificial intelligence l, the automatic processing of surrounding can be done.

In such way, it will require a negligible interference of humans and can perform its job by overcoming any obstacle.

8. REFERENCE

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