FULLY AUTOMATED SOLAR GRASS CUTTER

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Abstract **-** **In present world grass cutter machines are becoming very popular . Rapid growth of different high-tech tools and equipment makes our jobs much easier . Nowadays we are facing issues of pollution and power failures in our daily life . As we know pollution is manmade, so there are solutions for this problems too .Earlier grass cutters contains IC engine and hence because of its environmental impact, pollution level rises .IC engines are costly and hence the grass cutter is also costly.This was one of the main disadvantage of old model grass cutters. Maintenance cost of this conventional machine is also high.In order to overcome these drawbacks , we have thought about the device, which performs its functions without causing such problems.The project aims at implementing a grass cutting machine system which runs on solar energy .This model is economical compared to the previous one .Solar power doesn't release any green house gases.Hence it is safe and environmentally friendly. Also use of solar power reduces use of electricity .General principle of mowing were used in the designinig and developing of solar powered grass cutter .The designing of the project consists of solar panel,DC motor,motor driver,arduinoUNO,cutting blade,ultrasonic sensor.Arduino is used to control the entire system and hence the device is automated.Ultrasonic sensor is used for avoiding obstacles and the working of the same is also controlled by the microcontroller.The battery recharges by the solar charging controller and also less energy is required for cutting the grass.Hence the performance is more efficient than the conventional machine.Levelling of grasses in playgrounds,gardens etc.can be achieved by using this machine.The cutted grass left behind will also be collected along with the cutting operation by using grass collection technique.This is additionally inbuilted on the device.Since the device is fully automated no man power is needed and also skilled labourers are not neeeded to operate the device.Hence normal people can use this automated grass cutter without much efforts.**

Keywords-Solar,Grass cutter,Levelling,Economical,Pollution-Free

I. INTRODUCTION

Conventional grass cutters with motor-powered mechanism is inconvenient, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by aged people because grass cutter moving with engine create noise pollution due to the loud engine, and normal air pollution due to the combustion in the engine. Also, a motor-powered engine requires frequent maintenance such as changing the engine oil . According to world energy report, we get around 80% of our energy from conventional fossil fuels like oil (36%), natural gas (21%) and coal (23%). It is well known that the time is not so far when all these sources will be completely exhausted. So, alternative sources should be used to avoid energy crisis in the nearby future. So introduce solar energy for the machine process to work.

Automated solar grass cutter is a machine which utilizes revolving blades to cut a grass surface to an even height, people can easily maintain and beautify their lawns and gardens without any hassle. The height of the cut grass may be fixed by the design of the machine. Since it is fully automated it can be considered as a robotic vehicle powered by solar energy that also avoids obstacles. That is there is no need of human interaction . It uses a 12v battery to power the device for movement of motors as well as the blades.We also use a solar panel to charge the battery so there is no need of charging it externally. The movement motors and cutters are interfaced to an arduino uno microcontroller that controls the working of all the motors. It is also interfaced to an ultrasonic sensor for obstacle detection. The microcontroller allows the motion of the device in case no obstacle is detected. When an obstacle is detected , the ultrasonic sensor identifies it and the microcontroller stops the movement of grass cutter and thus avoiding any damage to the device as well as the object in front of it. Overall this machine will reduce the environmental and noise pollution.The main parts of the Grass cutting machine is Arduino uno ,AS 1012 model Solar Panel,L298N motor driver, DC Motors,HC-SR04 Ultrasonic Sensor,Batteries,PVC Pipe (mechanical body),100rpm Dc gear motor,Jumper wires,12volt 1 channel Relay module,Metallic Servo motor,Grass Cutting Blade. It is placed in a suitable machine structure. The cutting blades are attached in this machine. The raw materials mainly used are. Working principle of the grass cutter is providing a high speed rotation to the blade, which helps to cut the grass. The blade will get kinetic energy while increasing the rpm. The cutting edges are very smooth and accurate.

II. LITERATURE SURVEY

[A] MODIFICATION OF SOLAR GRASS CUTTING MACHINE

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A Solar grass cutter is a machine that uses spiral roller blades to cut a lawn at a faster rate. Solar grass cutter can operate manually and motor driven. Reel cutter of the grass cutter is given adjustable height. Even more sophisticated devices are there in every field. Power consumption becomes essential for future. Solar grass cutter is a very useful device which is very simple in construction. It is used to maintain and upkeep lawns in gardens, schools, college's etc. We have made some changes in the existing machine to make its application easier at reduced cost. Our main aim in pollution control is attained through this. we added remote control for unskilled person can operate easily and maintain the lawn very fine and uniform surface look. In our project, solar grasscutter is used to cut the different grasses for the different application.

Cutting grass cannot be easily accomplished by elders younger. Grass cutter moving with engine create noise pollution due to the loud engine, and local air pollution due to the combustion in the engine. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Even though solar grass cutter are environmentally friendly, they too can be an inconvenience. Along with motor powered grass cutter, grass cutters are also hazardous and cannot be easily used by all so we made the grass cutter easy to operate by using remote control Also, the electric grass cutter is manually operates . These grasscutter will also be will be charged from sun by using solar panels. It is also charging when work is going on. These grass cutter is having an AC charging also. These grass cutter is having spiral cutting blade to increase cutting efficiency. It can be operate manually or motor driven when motor driven it has a remote control.

[B] GREEN METHOD FOR MOWING LAWNS WITH MOBILE CONTROLLED SYSTEM

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In this time when the technology is merging with environmental awareness, consumers are looking for ways to contribute to the relief of their own carbon foot prints .Here we design a cost effective and efficient method for mowing lawns using solar based robotic lawn mower. The project is an autonomous lawn mower that will allow the user to the ability to cut their grass with minimal effort.Robotic lawn mower is a lawn mower running on electricity generated by photovoltaic panels or the radiated thermal energy available from collected sunlight as opposed to grid electricity. 80% of homes are using gas powered lawnmowers and create 5% of pollution. As an alternate green option to this environmental issue, we are using solar powered robotic lawn mower that will relieve the consumer from mowing their lawns and will reduce both environmental and noise pollution. This design contains a microcontroller, sensor and a solar charging system. Adding these elements together, we get our robotic lawn mower. Sensors are the eyes of our robot. This is done to let our robot

to see the difference between concrete and grass while monitoring its surroundings continuously. With recharging batteries, there are various chemistries but we decided to go with the one that work best with solar charging. Like batteries, there is a range of motors to choose from. We went with two 7.2 dc motors with integrated gear heads.

[C] AUTOMATED LAWN MOWER USING IOT

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The importance of lawn care simply cannot be ignored, as your lawn is a contributing factor to the beauty of your house. It needs care on regular basis. This project summarizes and reviews different technological developments for making efficient and cost-effective lawn mowers. A lawnmower is a device which is used to mow/ cut i.e. cut the grass of lawn to an even height. It can be operated manually or by some energy conversions such as solar power battery power etc. Generally, these are powered by electric motor or internal combustion engine and dc motors. In this project, effort has been made to modify the old mower to improve its usability. The overall geometry is made smaller and lighter. Adjustable cutting motor height is introduced for better mowing of grass at intricate locations.Lawn care and maintenance is a tedious thing to do for people who are always busy in daily life. Because it's not just about cutting the grass, it also includes services to receive the necessary nutrients to achieve its thickness, colour and overall health benefits. There are many things that are harmful to your lawn. for example, high temperature, draught, weeds, insects etc. There are several reasons for a lawn need a good care and maintenance. It helps prevent lawn diseases. Every season, problems like brown patch disease pose a threat to the health and stability of your lawn. Also it adds to your homes curb appeal. It contributes to healthy grass for family and pets to play in, its good for the environment and It helps control pests and weeds. A lawnmower is a device that helps to mow or cut the grass at desired height. Mowing the lawn with a standard motor powered lawn mower is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, or disabled people. Motor powered push lawn mowers and riding lawn mowers create noise pollution due to the loud engine, and local air pollution due to the combustion in the engine. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Even though electric lawn mowers are environmentally friendly, they too can be an inconvenience. Along with motor powered lawn mowers, electric lawn mowers are also hazardous and cannot be easily used by all. Also, if the electric lawn mower is corded, mowing could prove to be problematic and dangerous. We tried to provide solution to overcome these problems. Due to rapid development in the present information and communication systems, robots are designed to be widely used in small and large scale in every area of daily life and industries. They are employed to reduce human dependencies in performing a task and to reduce time for production while

maintaining consistent quality of production outputs. Robotic devices are widely used in manufacturing industries, advance surveillance systems and for domestic use as well. Modern houses include a compound often used as garden with grass which grows and need to be maintained at a short height.

III. PROPOSED SYSTEM
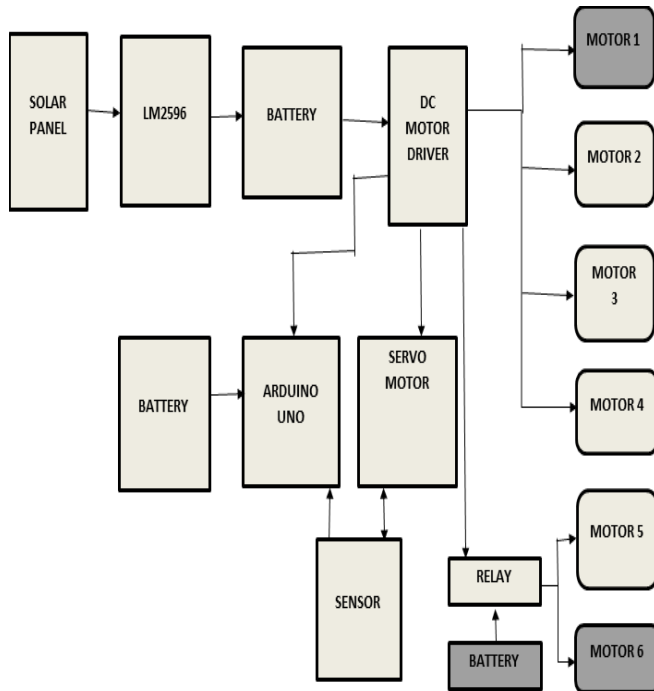
IV. CIRCUIT DIAGRAM
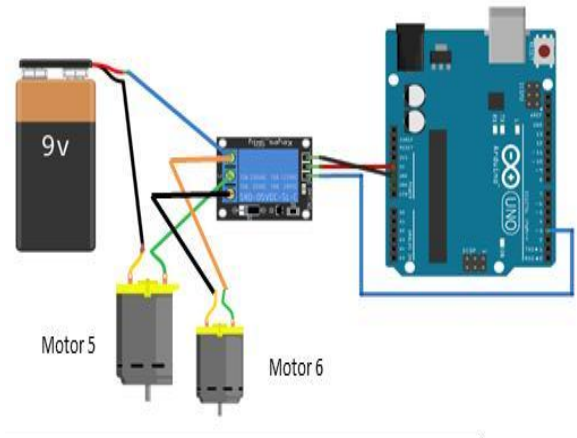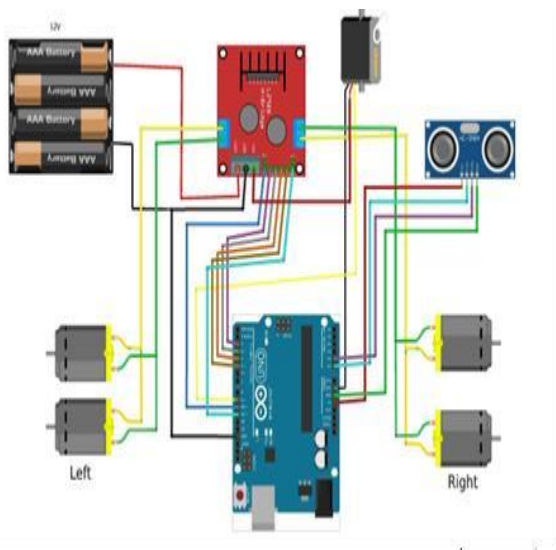
We have two motors in the left side and its forward direction is controlled by pin 7 and backward is controlled by pin 6. Similarly the forward and backward movement of right motor is controlled by pin 5 and pin 4 of the Arduino. The echo and trigger pin of the sensor gives 2 outputs. Relay is connected to the Arduino to connect the next two motors. A 9v battery is also connected to the battery. Motors are connected to the NC and ON pins of the relay and to the pin 3 of Arduino.

V. WORKING

We use Solar Panel of 10-Watt to charge the batteries which are rechargeable .These are high efficient solar panels of strong aluminum frame. These solar panels convert solar energy into electrical energy This is specially designed to charge Specially Designed to charge 12v/7Ah Battery . The solar panel gives maximum 18v and 580mA current. The voltage from the solar panel is never stable and varies drastically according to the position of the sun and intensity of the sun rays and of course on the degree of incidence over the solar panel. This voltage if fed to the battery for charging can cause harm and unnecessary heating of the battery and the associated electronics; therefore can be dangerous to the whole system.

In order to regulate the voltage from the solar panel normally a voltage regulator circuit is used in between the solar panel output and the battery input. For This we used a LM2596 12V voltage regulator IC, ideally suited for the easy and convenient design of a step-down switching regulator or buck-convertor. This regulator IC is capable of driving a 3A load with excellent line and load regulation. SO 12V from the solar panel reaches the battery followed by a L298N Motor Driver. The motors are driven by using this L298N motor driver .It is aslo known as H-Bridge This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motor. Motor driver acts as an interface between the motors and the control circuits. Motor require high amount of current whereas the controller circuit works on low current signals. So the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control. Here we uses 4 motors. Relay is

also connected to the driver. A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The next two motors are connected to the relay, so a total of 6 motors are used. One of these two motors are used for the working of the cutting blade and the other is used for mechanism of grass collection. The working of these two functions are done by using the two DC motor of 100 rpm.

Then coming to the working of the microcontroller, for that we need to give power to it and hence an additional battery is used. The Arduino uno takes the input from the ultrasonic sensors , when any interrupt or obstacle occurs the ultrasonic sensor senses the obstacle and gives feedback to Arduino, at this time the four motors connected to the dc driver and the two motors connected to the relay will stop functioning, then according to the program which was given , it makes the sensor turn left or right, it waits up to some delay and senses again and same procedure works. If no detection occurs in the sensor it will move forward until it find some detection.

After the grasses are cut down, there's a mechanism for the collection of the these grasses. The motor is attached to a fan, which has angled blades like an airplane propeller. As the fan blades turn, they force air forward, toward the exhaust port .When air particles are driven forward, the density of particles and therefore the air pressure increases in front of the fan and decreases behind the fan. This pressure drop behind the fan is just like the pressure drop in the straw when you sip from your drink. The pressure level in the area behind the fan drops below the pressure level outside the grass collector (the ambient air pressure). This creates suction, a partial vacuum, inside the grass collector. The ambient air pushes itself into the grass collector through the intake port because the air pressure inside the grass collector is lower than the pressure outside. As long as the fan is running and the passageway through the grass collector remains open, there is a constant stream of air moving through the intake port and out the exhaust port.

Here we used C programing for the working of Arduino. The entire device is controlled by this program given to the microcontroller. We have two motors in the left side and its forward direction is controlled by pin 7 and backward is controlled by pin 6. Similarly the forward and backward movement of right motor is controlled by pin 5 and pin 4 of the arduino. The echo and trigger pin of the sensor gives 2 outputs. For that a 'go run' function is enabled. During this time all the four motors will be in forward direction. During this forward movement the 'Ping' function is activated in the sensor and it will detect the obstacle's distance. If the distance of the obstacle is less than 10cm a signal is be passed to the Arduino and the driver will stop the four motors, at the same time motor connected in the relay also stops. During this time the servo motor connected to the sensor turns towards left and right then two distances will be calculated and these distances will get stopped. The Arduino compares these two variables and if the left distance is greater than right, the left motors were move forward followed by the backward movement of the right motors. After this a delay is given and the device makes an

angle equal to 45degree and turns in that angle. The same procedure continues repeatedly.

VI. RESULT

Here we used C programing for the working of arduino. The entire device is controlled by this program given to the microcontroller. Pin 7 controls the forward movement and pin 6 controls the backward movement. Similarly pin 5 and pin 4 controls the forward and backward movement of right motor. The echo and trigger pin of the sensor gives 2 outputs. Since 'go run' function is enabled, all the four motors were in forward direction. During this forward movement the 'Ping' function is activated in the sensor and hence detection of the object is done. Whenever the distance of the obstacle is less than 10cm , the driver will stop the four motors, at the same time motor connected in the relay also stops. This is because of the signal passed to the arduino. During this time we observed that the servo motor connected to the sensor turns towards left and right, and based on the program it calculates two distances. Whenever the left distance is greater than right, the left motors move forward and the right motors move backwards . As a delay is given and the device makes an angle equal to 45degree and turns in that angle. The same procedure seems to be repeating .

VII. FUTURE SCOPE

The solar panel can be fixed with light sensors. Thus depending upon the arrangement of the sun , the panel will be slanting such that the sun rays are incident normally (90 degree) to the solar panel. With this the device would be constant capable of trapping the solar energy at times when the strength of the sunlight is less.

Grass Can Be sensed Using AI Detection. AI detection and machine learning can be done on the device . Several types of grasses are studied using AI detection and then the images of these grasses are inbuild .Thus the device can detect whether there is a grass or not and also it can separate grasses from other plants.

Software side improvement using android Devices. This is done using the creation of an application in our mobile phones and hence the control of the device is in the hands of people itself. This will allow the person to control the device by giving commands as their wish.

Controlling the machine using IOT.IOT is internet of things which can be used to control the device. Each and every controlling can be done by this. This can also differentiate grasses from other plants . Also it can sense the type of grasses. All this operations can be done by using IOT.

VIII. CONCLUSION

In our grass cutter machine, the issues of pollution and power failures were eliminated which we used to faced in the old models . As we know, earlier grass cutters contain IC engine and hence because of its environmental impact, pollution level rises. IC engines are costly and hence the grass cutter is also costly. This was one of the main disadvantage of old model grass cutters. So our model is economical compared to the previous one. We are using Solar power, doesn't release any greenhouse gases. Hence it is safe and environmentally friendly. Due to the need for electricity, we rely on renewable energies. So use of solar power reduces use of electricity. General principle of mowing was used in the designing and developing of this solar powered grass cutter. The design of the project includes solar panel, switching voltage regulator, DC motor, motor driver, Arduino UNO, cutting blade, ultrasonic sensor. Arduino is used to control the entire system and hence the device is automated. Ultrasonic sensor is used for avoiding obstacles and the working of the same is also controlled by the microcontroller. The battery recharges by the solar charging controller and also less energy is required for cutting the grass. Hence the performance is more efficient than the conventional machine. Levelling of grasses in playgrounds, gardens etc. can be achieved by using this machine. The cutted grass left behind will also be collected along with the cutting operation by using grass collection technique. This is additionally inbuild on the device. Our project has been successfully completed and the results obtained are satisfactory. It will be easier for the people who will use this project for the further modifications. This project is more suitable for a common man as it has many more advantages such as fuel costs, no pollution and no fuel residues Since the device is fully automated no man power is needed and also skilled laborer's are not needed to operate the device. Hence this project eliminated the physical force required to push the mower without sacrificing safety. So we have met all requirements and achieved our goals for this project.

ACKNOWLEDGMENT

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