FULLY AUTOMATED SOLAR GRASS CUTTER

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Abstract –
This Paper Presents a Fully Automated Solar Grass Cutter. In the Present Generation Grass Cutting Machines Are Becoming Very Popular Today.Ic Engine Driven Cutter Is More Costly, it Consumes More Power. To Avoid These Drawbacks, We Make the Grass Cutter which Operates on Solar Energy. Hence Save Electrical Energy and Manpower. The grass Cutter is incorporated With Pesticide Sprayer attached with the grass Cutter. The Sound produced by the cutter is verry low.it can be used in Silent Zone Areas. such as hospitals, educational institutions. The grass Cutter Operates automatically hence it does not require skilled person to operate. The Main Advantage of our Project is to reduce the Space, cost and manpower Required.

Keywords: ATMega328p Micro controller, Ultrasonic Sensor, DC Motor, Motor Driver, Pesticides Sprayer, Robotic Chassis.

Introduction:
Grass-cutting machines have now become a necessity these modern days. They are reducing the time, cost, and labour for doing the work of maintaining the gardens and lawns and helping farmers remove weed grass, which would otherwise damage the plants cropped in agricultural fields. According to the place and purpose they are serving, the grass cutter is also commonly called a lawn.
mower or an agricultural weed cutter. Previously, the grass cutters were either gas or man powered. Cutting grass with normal grass cutters or with a sickle, as in a hedge, takes more time and human power. Solar-powered grass cutters make the work faster and easier. Because of their combustion engines, these traditional grass cutters produce a lot of noise and leave a carbon footprint in the environment, leading to an increase in pollution. The engines used in conventional grass cutters require periodic maintenance. In our daily lives, we are largely dependent on fossil fuels as a source of energy for industries, transportation, etc.
Pollution is gradually increasing due to this. So it is; therefore, as a result, it is our responsibility to reduce our carbon footprint on the environment by using alternative energy sources to power machines used for domestic purposes such as grass cutting. to move onto renewable sources of energy like solar energy, which can be obtained from the sun through its light rays and collected using a solar panel based on a photovoltaic cell. The availability and utilisation of solar energy in the farm during the daytime is higher when compared to tidal energy and wind energy, and mobility of the grass cutting machine is easier with a solar panel. A flow of electrons began when the protons from solar energy struck a photovoltaic cell. These electrons could then be pulled off by two wires to provide direct current (DC). A photovoltaic module is a cluster of electrically interconnected solar cells installed on a frame or support structure. These modules are designed such that they provide power at a specific voltage based on the requirements and can be stored using a battery, and the battery can be used to drive a motor.
The cells on the cathode and anode plates of the batteries in the solar grass cutter directly convert chemical energy to electrical energy. Within the cell, a chemical reaction will occur due to its chemical composition. The two half cells that make up each voltaic cell are connected by a conductive electrolyte that contains anions and cations. In our project, the grass cutter model is powered using a solar panel, which is used to drive the motor that runs the blade to cut the grass. We mainly focused on using a renewable source like solar energy as the power source to help farmers by making their work easier in agricultural fields. We carefully selected the cutter frame, high-rpm dc motor, and helical blade as the cutter in order to use the machine in both agricultural fields as well as in lawns for general maintenance purposes.

Literature survey

Automatic Solar Powered Grass Cutter Incorporated with Alphabet Printing and Pesticide Sprayer

1. M.Manimegalai are designed that Automatic Solar Powered Grass Cutter Incorporated with Alphabet Printing and Pesticide Sprayer. The maintenance of lawn can be done with the help of lawn mower. It is also difficult to cut the grass in different shapes with lawn mower.
2. The operation of the lawn mower is very difficult.so, The solar powered grass cutter is incorporated with alphabetic printing and pesticide sprayer.
3. The grass cutter is incorporated with alphabet printing mechanism then the cutting of grass in the shape of alphabets. The pesticide sprayer is also attached with the grass cutter.
4. All these machines are available as separate machines which requires more space and the cost for buying separate machines will be more. By incorporated of these machines in cutter reduces the cost. The main advantage of this project is to reduce the space, cost and manpower required.
5. Ayesha Sultana is designed that solar powered robotic grass cutting machine that eliminates the obstacles and could be accessed from every direction by utilizing hand gesture through remote camera which is introduced to the highest point of the motor-vehicle to communicate remote gushing to the users end.
6. maintaining posture by controlling the centre of gravity of a multi-legged mobile robot. Pulling a volcano observation robot with a wire. Slope movement using a snake-like robot. Traversing a slope with caterpillars or special wheels. Maintaining posture on a slope by pushing with air.
7. In method (1), the robot must be equipped with numerous actuators to create a robot with legs, and these actuators are not only heavy but also need to be controlled in a complicated manner.
8. In method (2), an advanced installation of wires is essential, and the robot can only move within a range that the wires can reach with no entanglement.
9. transporting payloads and other items is difficult compared to wheeled mobile robots. Alternatively, method (4) presents the advantage of being able to handle steep slopes by replacing the drive wheels with high friction wheels such as caterpillars or special wheels.
10. However, the maximum angle that the robot can climb is determined based on one parameter, that is, the coefficient of friction between the slope and wheels. Therefore, we propose to use method (5) to realize grass cutting on steep slopes.
11. This is a method that can handle steep slopes while maintaining the same control as that on a flat surface, and it can be used in combination with method (4). In method (5), the thrust force of the propeller mechanism (thrust generator) is applied to the body of the mobile robot, and this force pushes the body of the robot against the slope.
12. Compared to the explicit use of method (4), it is possible to add the thrust force, a robot-dependent control parameter of the propellers, which allows the robot to maintain its. Stability on the slope, in addition to the friction coefficient between the ground and wheel, an environment-dependent parameter.
13. To improve the application scope of field robots, it is important that they can navigate difficult terrains and traverse steep slopes. However, in the field of mobile robots, the research on movement on steep slopes is limited. Notably, turning is one of the most difficult actions for robots to perform on steep slopes.
14. The occurrence of slippage when turning with tracked wheels using skid steering is yet to be confirmed [14,20,21]. Skid steering is a method by which a wheeled or tracked vehicle takes a turn, and a skid steering vehicle has a greater wheel slip ratio when steering than when traveling in a straight direction [25]. When a robot turns to the right via skid steering, the left side wheels of the robot move forward, and the right-side wheels move in reverse.
15. The phenomenon of wheel slip occurs when the grip between the wheel and surface is reduced during sharp turns or on slippery road surfaces. Although propeller thrust can be

used, previous studies have not analysed the effects of rotational motion on the design [22,23,24].

16. The robot may slip if the thrust force is weak. However, if the thrust force is increased, the grip of the wheels will be too strong, and the robot may not be able to turn. The other option is to use steering wheels.
17. A robot with a steering wheel can move stably without losing grip on the ground during turning. However, a mobile robot on a slope faces another problem; that is, the robot may fall on the slope because of the change in the canter of mass. Therefore, a slope robot with a Mecanum wheel is proposed [26,27].
18. A Mecanum wheel can perform holonomic motion on a slope; hence, there is no need to change the center of gravity with respect to the robot position. In addition, the use of a Mecanum wheel allows the robot to perform a pivot turn, resulting in minimal loss of movement.
19. In [28], it was discovered that Mecanum wheels have a good load carrying capacity, but on an inclined or uneven surface the rim of the wheel may touch the surface instead of the roller, preventing the wheel from operating correctly.
20. Although the robot needs to touch the ground using its wheels, Veerajagadheswar et al. presented a slope cleaning robot with Mecanum wheels in their study; this robot was able to cover more than 98% of the total area when the slope was 20° and achieved a coverage of 95.07% when the slope was 30° [26].
21. In a study conducted by Ransom et al., the developed robotic planetary rovers with Mecanum wheels realized locomotion on sandy terrains with a 30° slope; however, they also reported that slippage occurred when turning on a 10° slope [27]. Typically, grassy terrain can be difficult for Mecanum wheels owing to its unevenness.
22. To achieve better performance on rough terrains, Reina et al. [29] and Qu et al. [30] proposed a four-wheel-drive/four-wheel-steer robot. The corresponding experiment indicated that the proposed robot could be used on an all terrains for agriculture. It was demonstrated that the proposed approach was effective in reducing slippage and vehicle posture errors; however, experiments on the influence of slopes are still lacking.
23. In previous studies, slope mobile robots focused on stabilizing attitude behaviour on slopes and simple straight-line movement have been investigated; however, for performing tasks on a slope, stability when the robot changes direction is also important.

Related Work

A solar-powered grass cutting system that operates automatically to cut the grass and pesticide sprayer. The system is self-sufficient, using 12V batteries for the motors and a solar panel to charge them. The ATmega 328P microcontroller controls the motors and responds to obstacles detected by an ultrasonic sensor. When no obstacles are present, the grass cutter and vehicle motors move forward. However, if an obstacle is detected, the grass cutter motor is stopped to prevent damage to any objects, humans, or animals. The microcontroller then reorients the vehicle until it has a clear path and resumes forward movement of the grass cutter.

Methodology

`An automatic grass cutter was implemented by using a 10W solar panel is used to charge the battery, which is rechargeable. the solar panel gives a maximum of 18V. We need a charging circuit between the solar panel and the batteries. The charging circuit has a voltage regulator that regulates the voltage to 15V and one transistor to amplify the maximum current into the circuit and a diode is used. We use a 12-volt battery and connect the batteries and the motors between them motor controller circuit for voltage regulation up to 12V. The 8051 microcontroller takes input from the ultrasonic sensors, when there is a break or obstacle, the ultrasonic sensor senses the obstacle and gives feedback to the microcontroller, then it turns left or right according to the program given to the microcontroller. It waits for a certain delay and rescans, and the same process works. If there is no detection in the ultrasonic range, then it moves forward until it finds some detection. B The movement of the robot is carried out using two 100 rpm DC motors. The motors are driven by a motor controller (L293D). It is also known

as H-Bridge. The main purpose of using a motor controller is because DC motors. The microcontroller provides only 5V output, so we require 9V to 12V to drive the motors. So, we use a motor controller that takes 5v as input and gives 12v for the motors. The L293D motor controller controls only two motors that can move in either direction. A cutting blade is used.

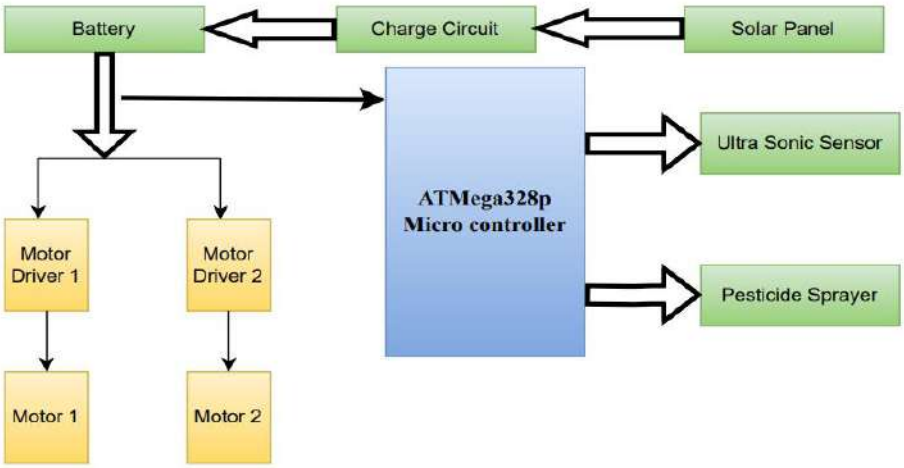

Fig.1 Block diagram

Results

Our project fully automated solar grass cutter is successfully completed, and results are obtained satisfactorily.

fig.2 Fully automated solar grass cutter

Conclusion

It will be easier for the people who are going to take the project for the further modifications. This project is more suitable for a common man as it is having much more advantages that is, no fuel cost, no pollution and no fuel, less wear and tear because of a smaller number of moving components and this can be operated by using solar energy. This will give much more physical exercise to the people and can be easily handled. This system is having facility of charging the batteries while the solar powered grass cutter is in motion. So, it is much more suitable for grass cutting also. The same thing can be operated in nighttime also, as there is a facility to charge these batteries in day light.

Future scope

Fully automated solar grass cutter has the potential to revolutionize lawn maintenance by providing an eco-friendly cost-effective solution. Here some potential future scopes for fully automated solar grass cutter.

1. Increased efficiency: the future of solar grass cutters will involve increasing their efficiency. This could be achieved through advancements in machine learning and artificial intelligence, which will enable these machines to better direct and avoid obstacles, navigate complex terrains, and adjust cutting patterns as per requirements.
2. Customizable cutting patterns: the future of solar cutters will also involve customizable cutting patterns, homeowners will be able to program these machines to cut their lawns in specific patterns, there by achieving a desired look or aesthetic.
3. Adaptability: future solar grass cutters can be designed to adapt to different types of grass and terrains. This can be achieved by incorporating sensors that can detect the type of grass and adjust the cutting height accordingly, or by using artificial intelligence to map the lawn and adjust the cutting pattern based on the terrain.

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