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Hybrid automated lawnmower

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ABSTRACT

The project's goal is to build an automated hybrid lawn mower that runs on IoT and solar energy instead of fuel, which will help with energy saving. The goal of this project is to build a hybrid automated lawn mower with a DC motor, rechargeable battery, solar panel, blade, and an IoT-based control system. The system has two modes: automatic and manual. The system is powered by a 12-volt battery. The solar lawn mower is controlled by a switch on the board that shuts the circuit and allows electricity to pass to the motor that drives the blade to move. During manual mode, we can operate the robot via a Bluetooth controller. For programming, the Arduino IDE software is utilized. Obstacles are detected using an ultrasonic sensor. Solar charging is used to recharge the battery.

Keywords— *Solar, Grass Cutting Machine, Hybrid Power Supply, Remote Controlled, Temperature and Humidity Sensor*

1. INTRODUCTION

Nowadays, pollution is a big challenge for the entire world. Pollution is a result of human influence, and it may be observed in our own houses. Lawn mowers that are powered by gas or gasoline add to pollution because of the gases they emit. Moreover, with the rising cost of fuel, it is not ideal for the common citizen. As a result, it is not efficient.

We propose the project autonomous solar grass mower that will allow the user to maintain their gardens with minimal effort. The solar powered lawn mower is an improvement on cordless electric lawn mower. Moreover, a small battery storage which store energy from both solar and household supply is inserted in the device to make the system workable on rainy day. And to improve efficiency we propose both automatic and manual mode of operations. In this project, an effective, lightweight, and portable solar power-driven automatic grass cutter is proposed.

As trained manpower is becoming a problem nowadays, planning of automatic system is the smart solution. This project of a solar powered automatic grass cutter will relieve the consumer from moving their own lawns and will reduce environmental, noise pollution and reduce physical labor. Ultimately, the consumer will be doing more for the environment while doing less work in their daily lives.

2. LITERATURE REVIEW

The existing solution was replacing the fuel powered motors to motor-powered which reduced pollution [1]. As conventional energy sources are running out and electricity is costly, energy experts have been thinking about the alternative available sources. Electrical energy generated from solar radiation using solar panel has become popular.

DC power is generated from photovoltaic solar cell which can be used to drive any dc load within its capability including wireless battery charger [2], automatic grass cutting machines and so on. Even with an electric motor mower there still was a downside, a person must be there to control the machine [3], this was solved by introducing wireless controlling of the machine using remote device [4].

Remote controlled machine is also not completely deprived of humanly presence, so researchers introduced ultrasonic sensor, which is used for obstacle detection and the robot will move forward until a detection is detected [5]. Drawback of this system was that even when robot is ON for a long period still the work may not be completed, and there are no boundary conditions set.

As an improvement humidity sensor was used to distinguish between grass and concreate [6] as water content is different for both. But this was not 100% accurate and may vary with

moisture content in the atmosphere and different regions. Here boundary lines are set using boundary wires, so the robot doesn't go beyond it.

3. PROPOSED METHODOLOGY

In this project, we're developing an autonomous lawn mower that runs on a hybrid power supply, which contains both solar energy and external power. When there is no sunlight and the stored charge is depleted, we can recharge it using the mains supply. Here, a converter is used to convert ac to dc, which is then stored in the battery. We employ an ESP series microcontroller device with Bluetooth and Wi-Fi capabilities, which we utilize for remote control and end-point IoT development.

This system will have 3 wheels, the 2 main wheels will be powered with 2 dc motors. This motor will be controlled by the signal coming from the microcontroller. This will be a H-bridge circuit which will be used as driver circuit for the 2 motors the microcontroller will gives signal to these 2 motors. Depending upon the signal coming from the remote control in manual mode, commands will be by the user.

In automatic mode user can configure how many steps need to move in forward, backward, left & right. Also speed of the grass cutting machine can be adjusted. After completing automated mode selection, grass cutting machine will move according to the instruction of the user. These instructions can be changed at any point of time with the help of a selection panel provided. Push buttons are used to enter the data and a lcd is used to display the selection menu between modes.

The robot is equipped with ultrasonic sensors which will detect obstacle to avoid the damage of human, object and animal. On detection it can be programmed either to stop and signal the user with a buzzer or it will deviate from its given path and will deviate into default path programmed. It also has a temperature and humidity sensor which gives a user a glimpse of the weather outside.

The main task of cutting the grass is done using a blade attached to a rotary motor attached to the robot. This motor will be of about 60 -100 rpm. This motor is connected to the MCU through a 12v relay. In controlling and monitoring unit Bluetooth module is used for remote controlling. the remote can be used for a range of 10-15 meters. Data storage and collection can be acquired by IoT features and it make use of LAN network.

3.1 Block Diagram

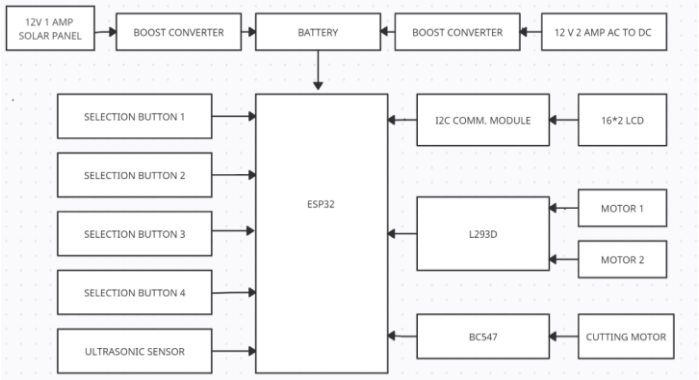

Fig. 1: Block diagram of proposed system

4. RESULTS AND DISCUSSION

(a) Lawn conditions, grass density, moisture content, grass length, and cutting height all impact the area of cut.
(b) The maximum cutting height is 10 cm.
(c) The run time is 4 hrs.
(d) Through an ultrasonic sensor, this robot will not only stay on the lawn, it will avoid and detect objects and humans.
(e) With its remote-control capability, the lawn mower stays within the boundaries of the lawn because the user is able to have fun control over the lawn mower with the controller.
(f) This prototype is also environmentally friendly.

5. CONCLUSION

With the assistance, the labor cost and manpower will be greatly reduced as a result of this robotic vehicle. There are two modes of operation, each designed for a different set of circumstances. Automatic mode is highly handy for operation when the owner is not present in the grass field, although monitoring services can employ manual mode.

No additional assistance is needed. Time required is reduced and power consumption is also reduced by planning out its route. Improvement on grass cutter power source is feasible and hence a successful operation. Furthermore, any constraint faced may be used as future references and open for more improvement. All of this is made available for common people.

6. REFERENCES

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