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SMART PHONE CONTROLLED SOLAR GRASS CUTTER ROBOT USING BLUETOOTH

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ABSTRACT

The fully automated solar grass cutter is a fully automated grass cutting robotic vehicle powered by solar energy that also avoids obstacles and is capable of fully automated grass cutting without the need of any human interaction. The system uses batteries to power the vehicle movement motors as well as the grass cutter motor. We also use a solar panel to charge the battery so that there is no need of charging it externally. The grass cutter and vehicle motors are interfaced to Arduino family microcontroller that controls the working of all the motors. The robotic movements like forward, backward, left, right and stop will be controlled from the mobile app using bluetooth technology. The data received from the android phone application by the Bluetooth module is given as an input to the Arduino microcontroller and the controller acts accordingly on the DC motors of the solar grass cutter.

INTRODUCTION

Traditionally and even now in many places like an institution, organization, sports ground, industries, hotel, public center etc, cutting of grasses was done with a cutlass. This manual method is time-consuming and also inaccuracy level of cutting is observed. With the advent of technology, cutting of grass done with single or more blades to cut the grass surface to a uniform height. Normally, the height of the grass cutting will be adjusted or fixed from the operator end either by lever or nut adjusted to the machine wheels. This trims the grass utilizing very little time and also optimizes the human power involvement to a minimum level. Based on the one requirement several types of Grasscutter are available to assist one in having the best Grasscutter. Even the power source for the grass cutter plays a vital role while designing the best tool for the user end. Technology oriented cutting down the grass has been implemented adopting modern energy sources such as petrol, electricity, propane etc.

Petrol-powered Grasscutter pushes the rotary mowers powered by an internal combustion engine of four-stroke used for maximum torque and cleaner combustion. The power consumption generally ranges from hp (horsepower) equipped with a single-cylinder having a carburettor, so the engine needs to be started in manual pull crank method even though few models provided with an electric starter. Electric-powered Grasscutter is available with two types such as corded and cordless electric Grasscutter both producing an average of

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fewer than 75 decibels compared to more than 95 decibels of petrol-powered Grasscutter. Corded Grasscutter limits its range depending on the cable wire availability and also may lead to being hazardous when Grasscutter accidentally moves over the cable wire, which leads to a chance of high risk of receiving electric shock to the user. Cordless Grasscutter uses rechargeable batteries to deliver power to the Grasscutter, more number of batteries leads to more run time of Grasscutter. But these are more expensive and disposal of worn-out batteries is problematic. Compared to petrol-powered Grasscutter even the performance is less considering the parameter of the same weight. To overcome all this issues leads to a rise of new technical domain-based Grasscutter such as Solar powered Grasscutter that interfaced with IoT (Internet of Things) technology to control its operation and movement.

In this paper, a new approach is proposed for cutting grass based on Solar-powered Grasscutter, with minimal intervention of human involvement adopting IoT technology. IoT technology is the connection of physical things that are embedded with electronics components and software to enable greater services for the connected things with applying computation and analysis. Here our proposed model aims at designing and developing a prototype to operate with highly versatile, much durable, highly comfortable, powerful and avoiding obstacles in the path.

PROPOSED SYSTEM

The grass-cutting robot, also known as a lawn mower robot, is a robotic device designed to automatically cut and maintain a lawn. These robots use sensors and algorithms to navigate and mow the lawn and can be programmed to cut the grass on a specific schedule or in response to the growth rate of the grass. Some grass-cutting robots are also equipped with features such as obstacle detection, anti-theft protection, and remote control via a smartphone app. They are becoming more popular in recent years as a way to save time and effort on lawn maintenance.

The robots are usually equipped with a cutting mechanism, which can be a reel of cutting blades or a rotary blade. The cutting height can be adjusted to suit the length of the grass and the robot can be programmed to cut the lawn at a specific height. Some robots also have a mulching function, which finely cuts the grass clippings and returns them to the lawn as a natural fertilizer.

Overall, grass-cutting robots are a convenient and efficient way to maintain a lawn. They can save time, effort, and energy compared to manual lawn mowing and can help ensure that the lawn is kept in good condition all year round.

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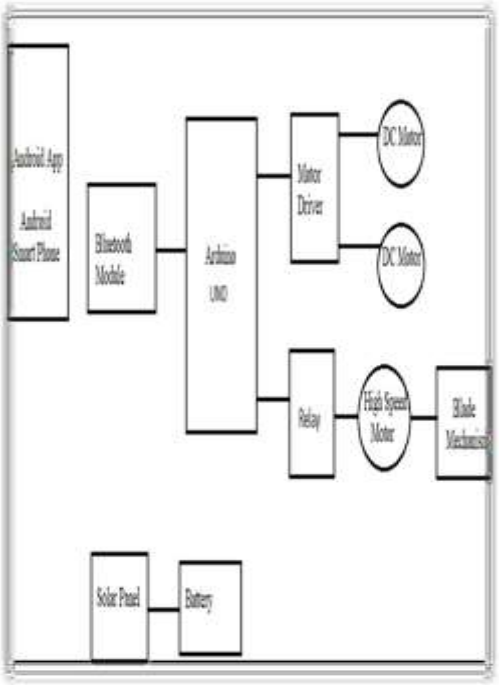

Fig.1: Block Diagram

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digitalinput/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-toserial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

The Arduino Uno can be powered via the USB connection or with an external power supply. The powersource is selected automatically.External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adaptercan be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from abattery can be inserted in the Gnd and Vin pin headers of the POWER connector.The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5Vpin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board.

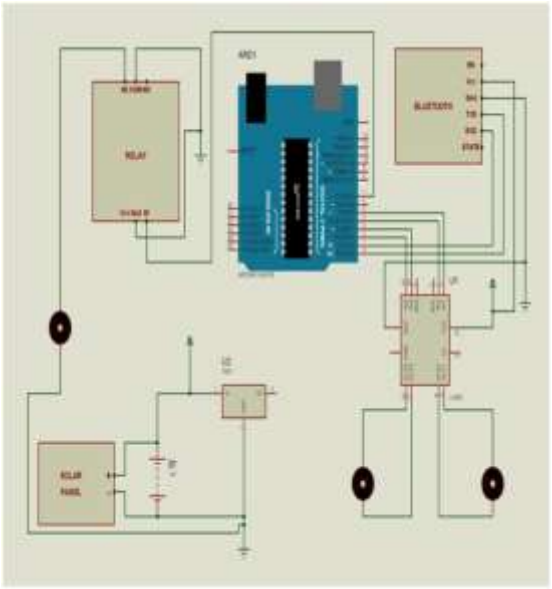

Fig.2: CIRCUIT DIAGRAM

The Arduino Uno has a number of facilities for communicating with a computer, another

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Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USBCOM drivers, and no external driver is needed. However, on Windows, an *.inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-toserial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A SoftwareSerial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also support I2C (TWI) and SPI communication.

WORKING

The block diagram of "Solar Grass Cutter". At first, solar panel will receive the sun rays, which produces electricity due to photovoltaic effect. This produced electricity gets stored in the battery.

The power from the battery is given to the microcontroller (Arduino UNO) which controls the functioning of the device by the receiving data from the Bluetooth module. The machine uses Bluetooth module to receive data from the smartphone and based on the data it moves forward, backward, right, left and stop.

The machine is fed with a program (Embedded C). First we need to connect smartphone to the Bluetooth Module by the pairing. We use mobile application in smartphone to control the solar gas cutter robot. In that application We have different buttons to control the robot in a different direction.

When smartphone sends character "F" that means based on the program the both motor M1 and motor M2 are move in forward direction. When we send character "B" that means both motor M1 and motor M2 are move in backward direction. If we send character "R" then means motor M1 moves in forward direction and motor M2 move in backward direction.

When we send character "L" then means motor M1 moves in backward direction and motor M2 move in forward direction. If we send character" S" that means both motor M1 and motor M2 are turn OFF.

Two DC gear motors are used which are connected to the backside wheels of the vehicle.

So, it can move in forward, backward, right, left and stop. which helps in rotation of the wheels and gear motor are driven by the motor driver, which in turn connected to the microcontroller.

High speed DC motor is connected to the blade, which is placed on front side of the vehicle and helps in rotation of blade. The motor is fixed to blade, which is mounted on an adjustable plate such that the blade height can be adjusted from 10mm to 70mm from the ground level. Blade is designed in such a way that it cuts the grass efficiently. Two switches are used one for switching the

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microcontroller and another to switch a DC motor that is used for blade rotation.

To control the high-speed DC motor, we need to send character "1" to turn on the high- speed DC motor. when we send character "0" that means the high-speed motor is turn off.

Considering environmental awareness, Solar Grass Cutter robot is most efficient and eco-friendly which overcomes the drawbacks of fuel-based grass cutters such as (i) fuels, which are non-renewable, (ii) Need proper maintenance, such as lubricants. Solar Grass Cutter machine was designed by considering important aspects such as efficient, accuracy, eco- friendly, durable and low cost The major components of Solar Grass Cutter robot model are solar panel, batteries, microcontroller, Bluetooth module, motor driver, DC motors and blade. The abundant solar

energy was collected, with the help of solar panel which was used as a source of energy. The batteries were used to store the electrical energy produced by the solar panel. Micro controller was used to store the program codes which controls the direction of the Solar Grass Cutter robot.

The smartphone transmitting signals are received by the Bluetooth Module, Now the Bluetooth Module send the data to microcontroller then the micro controller sends the signals to motor driver so that wheels move in different directions based on the program. Two types of DC motors were used based on the requirement of rotational speed. The DC motors with 30 RPM were used to move the vehicle and DC motors with 500 RPM was used for the blade rotation. The blade of the prototype can be adjusted based on the height of the grass need to be remove. The minimum height of grass can be cut with this prototype is 10 mm and maximum height up to 75mm.

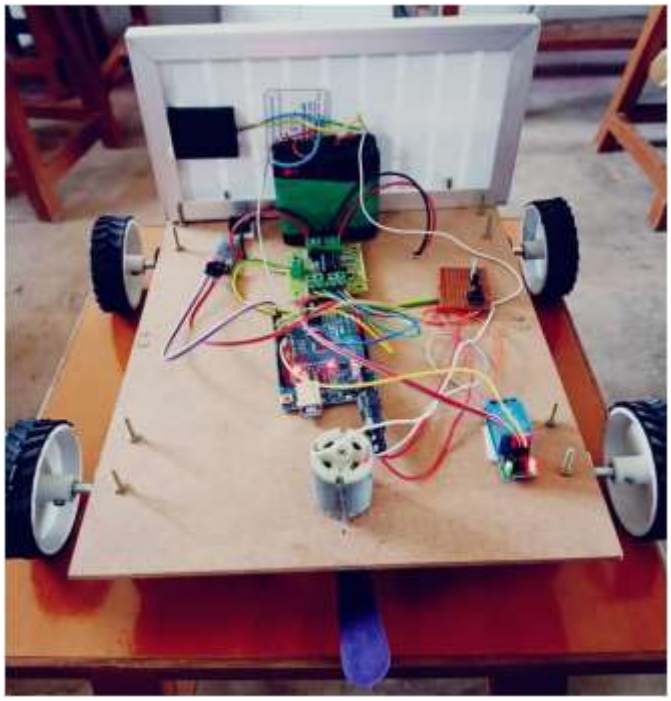

Fig.3: Photocopy of Project

ADVANTAGES

- Easier to operate
- Small size and portable
- Reduces manual labour and cost of electricity
- Solves the problem of manual labour shortage by autonomous
- Use of solar power saves energy thereby reduce greenhouse
- Cost effective
- Phone control

APPLICATIONS

- Lawn care taking in residences.

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- For corporate offices.
- For cricket, football and other sports fields.
- For parks, playgrounds

CONCLUSION

Thus the "Automatic Solar Grass Cutter Robot" has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. The system has been tested to function automatically. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the microcontroller which triggers the water pump to turn on and supply the water to respective plant. When the desired moisture level is reached, the system halts on its own and the water pump is turned off. Thus, the functionality of the entire system has been tested thoroughly and it is said to function successfully.

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