Green Groom - An Automatic Solar Grass Cutter and Shaper

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Abstract*—Arduino NANO- powered Grasscutter driven by solar energy intended to trim healthy grass in public areas, hotels, parks, etc. The Grasscutter is constructed with LIDAR and solar power, and it can be operated remotely using a Bluetooth module. An Arduino NANO, a solar panel, a DC motor, a motor driver, infrared sensors, rechargeable batteries, and a Bluetooth module are among the hardware components of the proposed device.. The Arduino IDE is used to programme the developed model, which governs how the grasscutter operates. The grasscutter prototype's on, off, and stop operations, as well as its control mechanism and motions, consist of forward, backward, right, and left movements. A LIDAR fixed to the system's head allows it to steer clear of obstacles while moving.

Keywords: Arduino NANO, solar panel, DC motors, motor driver, infrared sensors, rechargeable batteries, Bluetooth module, Arduino IDE, forward and backward movement, right movements, left movements, on/off mechanism, stop function, LIDAR, obstacle avoidance, grasscutter, remote control.

I.Introduction

Traditionally, and in many locations even now, grass cutting was done by hand with a cutlass. Nevertheless, this process takes a lot of time and frequently produces uneven cutting. Thanks to technological advancements, cutting grass is now accomplished with the use of one or more blades that can level the grass to a consistent height. Typically, a lever or nut on the machine's wheels allows the operator to change the height of the grass cutting. This method reduces the quantity of human labour needed while enabling effective grass cutting. A variety of grass cutter types are available to meet different purposes, and selecting the right power source is essential to creating the optimal instrument for the user.

II.Ease of USE

Ultramodern grass-cutting technologies use energy sources such as gasoline, electricity, propane, and more. Solar-powered grass cutting robots are novel electronic devices meant to automate lawn care using solar energy as a power source. These robots are outfitted with sensors and intelligence algorithms that enable them to navigate various terrains, avoid obstructions, and effectively cut lawns. The concept of a solar-powered lawn cutting robot appeared. as a result of the need to reduce homemade labour in field conservation, improve effectiveness, and reduce the environmental impact of field care conditioning. These robots have come increasingly popular in recent times, especially in areas where there's a high demand for field care service. A solar power lawn cutting robot's main benefit is that it runs on solar energy, which is a plentiful, clean, and renewable energy source. By employing the power of the sun, these robots can operate for extended ages without demanding to be recharged, and they emit zero carbon emigrations, making them an environmentally friendly volition to traditional gas- powered field mowers. Another significant advantage of solar power lawn cutting robots is their independent operation. These robots are equipped with advanced sensors and mapping software that enable them to navigate through different terrains and avoid obstacles, similar as trees, rocks, and other objects in their path. This makes them ideal for use in large meadows, golf courses, parks, and other out-of-door spaces that bear frequent conservation. In addition to their independent operation, solar power lawn cutting robots are also equipped with cutting- edge technology that allows them to cut grass efficiently and effectively. In order to maximise their cutting patterns and guarantee that they precisely cut the lawn to the desired height and position, these robots employ sophisticated algorithms. Another benefit of solar power lawn cutting robots is their low conservation conditions. Since they use solar energy as their primary power source, they don't bear frequent oil changes, spark draw reserves, or

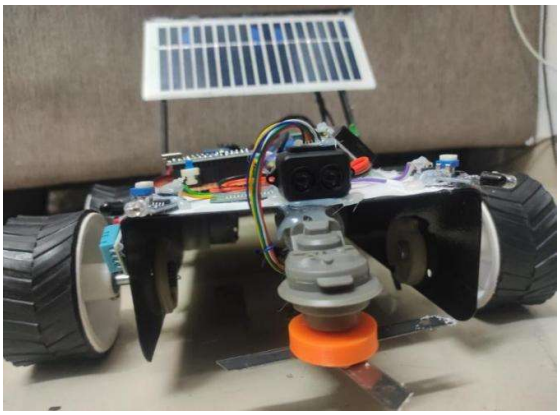
other conservation tasks generally associated with traditional gas- powered field mowers. This translates into lower conservation costs and a longer lifetime for the machine. Overall, solar-powered lawn mowing robots are a big turning point in field care technology.They offer a sustainable, effective, and cost-effective result to the challenges associated with manual field conservation. As technology continues to evolve, it's likely that we will see further advancements in this field, leading to indeed more sophisticated and intelligent field care machines that can transfigure the way we manage our outdoor space.

III.EXISTING SYSTEM

THE CURRENT APPROACH TO FIELD CONSERVATION GENERALLY RELIES ON MANUAL LABOR AND TRADITIONAL ENERGY- POWERED LAWNMOWERS. HOMEMADE MOWING REQUIRES SIGNIFICANT PHYSICAL TROUBLE AND TIME, AS MORTAL DRIVERS EITHER DRIVE OR RIDE THE LAWNMOWER ACROSS THE FIELD. CONVENTIONAL LAWNMOWERS, POWERED BY FOSSIL ENERGIES, CONTRIBUTE TO ENVIRONMENTAL POLLUTION AND ARE DEPENDENT ONNON-RENEWABLE ENERGY SOURCES. THESE SYSTEMS LACK ADVANCED AUTOMATION FEATURES, REMOTE CONTROL CAPABILITIES, AND SMART FUNCTIONALITIES. OVERALL, THE BEING SYSTEM IS CHARACTERIZED BY LABOR- FEROCIOUS PRACTICES AND LIMITED TECHNOLOGICAL INVENTION, WITH IMPLICIT ENVIRONMENTAL DOWNSIDES DUE TO THE USE OF CONVENTIONAL ENERGY SOURCES.

IV.PROPOSED SYSTEM

The proposed system introduces a paradigm shift in lawn maintenance with the development of a solar- powered grass-cutting robot incorporating Bluetooth connectivity. Solar panels are integrated into the design to harness renewable energy from the sun, reducing the environmental impact associated with traditional energy- powered druther . Bluetooth technology is employed for wireless communication, allowing users to control and cover the robot ever using a smartphone or devoted control unit. The robot is equipped with automated navigation features, using sensors for obstacle detection and ensuring effective coverage of the field. AI- based cutting algorithms enable precise and adaptive cutting patterns based on lawn height and viscosity. The system also prioritizes safety with exigency stop mechanisms and obstacle avoidance, while effective energy operation optimizes the use of solar power. The user-friendly interface, environmental considerations, and implicit for future upgrades make the proposed system a more sustainable, effective, and technologically advanced result.



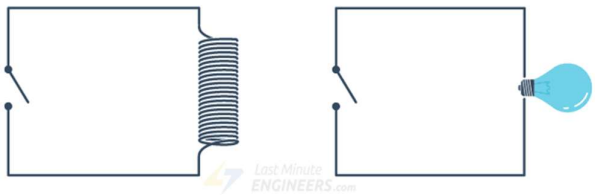
V.HARDWARE

ARDUINO NANO

The Arduino Nano is a compact, full, breadboard-friendly board based on the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x). It provides the same capabilities as the Arduino Duemilanove in a different packaging. It only lacks a DC power jack and operates with a Mini-B USB cable rather than a conventional one. Gravitech is the company that designed and manufactures the Arduino Nano. Arduino Nano3.0(ATmega328) schematic, Eagle lines. Arduino Nano2.3(ATmega168) manual(pdf), Eagle lines. Because the free interpretation of Eagle cannot handle more than two levels, and this interpretation of the Nano has four layers, it is published and unrouted, allowing users to open and utilise it in the free interpretation of Eagle. Atmel ATmega168 or ATmega328 Microcontroller Operation voltage (sense position) 5 V is the recommended input voltage. Input Voltage (7–12 V, maximums) Six of the fourteen digital I/O legs (20 V, six of which are PWM output) Pins for Analogue Input Each I/O, 8 DC Current Pin 40mA SRAM 1 KB (ATmega168) or 2 KB (ATmega328) EEPROM 512 bytes (ATmega168) or 1 KB (ATmega328) Flash Memory 16 KB (ATmega168) or 32 KB (ATmega328), with 2 KB used by the bootloader 16 MHz clock speed Measurements0.73" by 1.70" Pin 30 of the Mini-B USB connection, pin 27 of the 5V regulated external power supply, or pin 6 of the 20V restricted external power supply can all be used to power the Arduino Nano.

How Do Relays Work?

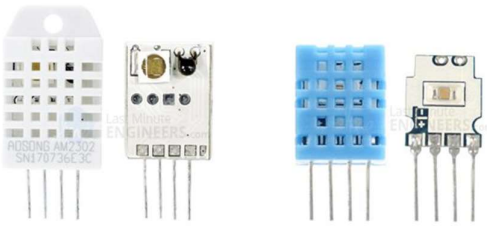
A relay is an electromagnetic switch that operates on a little current but can regulate much bigger currents. Here's a basic vitality that demonstrates how the relay utilises one circuit to switch on another.



The first circuit is initially switched off, and no current flows through it until it is activated (for example, by a sensor or a switch closing). The alternate circuit is also switched off. When a modest current flows through first circuit, it triggers the electromagnet, creating a magnetic field all around it. The energised electromagnet attracts a contact in the alternative circuit, causing the switch to close and allowing a considerably larger current to pass through it. When the current ceases to flow, the contact returns to its normal position, turning the alternate circuit off again.

DHT11 Vs DHT22/AM2302

We've two versions of the DHTxx sensor series. They seem identical and have the same pinout, but have distinct properties. Here are the specifics. The DHT22 is the more expensive variant, with noticeably superior specifications. Its temperature measurement range is -40 °C to 125 °C with an accuracy of -0.5 degrees, whereas the DHT11 has a temperature range of 0 °C to 50 °C with an accuracy of -2 degrees. Also the DHT22 sensor has better humidity measuring range, from 0 to 100 with 2- 5 accuracy, while the DHT11 moisture range is from 20 to 80 with 5 accuracy. Though DHT22 is more precise, more accurate and works in a bigger range of temperature & moisture; there are three effects where the DHT11 beats the DHT22. It's less expensive, lower in size and has advanced sampling rate. The DHT11 has a sampling rate of 1Hz, which is one reading every alternate, but the DHT22 has a sampling rate of 0.5Hz, or one reading every two seconds. However, the operational voltage of the two sensors is from 3 to 5 volts, while the uttermost current used during conversion(while requesting data) is2.5 mA. And the stylish thing is that DHT11 and DHT22 sensors are ' swappable ' – meaning, if you make your design with one you can just open it and use another. Your law may have to acclimate a little but at least the wiring is the same! Hardware Overview Now let's move on to the intriguing stuff. Let's disassemble both the DHT11 and DHT22 sensors & see what's inside. The covering is divided into two halves, so getting inside is as simple as using a sharp cutter to tear the case apart. Inside the case, on the viewing side, there is a moisture-detecting element as well as an NTC temperature sensor.



How Does LIDAR Work?

The working premise of a Light Detection and Ranging system is very basic. A LIDAR sensor installed on a plane or helicopter. It generates a laser pulse train that is sent to the surface/target to determine the time it takes to return to its source. The actual calculations for determining the distance a returning light photon has travelled to and from an object is calculated as

Distance = (Speed of Light x Time of Flight) / 2

HC-05 BLUETOOTH MODULE

HC-05 BLUETOOTH MODULE PIN DIAGRAM

The HC-05 Bluetooth module is designed to obtain wireless communication. This module can be used in either a master or slave setup. Bluetooth periodical modules allow all periodical-enabled bias to communicate with one another over Bluetooth. It has six legs. Key / EN It's used to put the Bluetooth module into AT commands mode.This module will also work in command mode if the Key/EN leg is set to high. Otherwise, it defaults to data mode. In command mode, the HC-05's default baud rate is 38400bps, while in data mode it is 9600. HC-05 module has two modes: 1. Data mode. Data exchange between biases. 2. Command Mode It uses ATcommands to adjust the HC-05's settings. These commands are sent to the module's serial port (USART). 2. VCC Connect 5 V or3.3 V to this Pin. 3. GND Ground Pin of the Module. 4. TXD Transmit periodic data (wirelessly entered data by Bluetooth module sent out serially on the TXD pin). 5. RXD Receive data serially (the Bluetooth module will wirelessly transmit the received data). 6. State It indicates if the module has been connected or not.

VII. CONCLUSION AND FUTURE SCOPE

In this paper, an eco-friendly solution for lawn mowing is proposed. Based on observations, it can be determined that the system is more efficient than previous designs because it eliminates the need for human labour and is pollution-free. The system works very well on flat surface lawns. However, in the case of uneven surfaces, the obstacle detection stage may fail to detect objects near the system.The ability to cut grass in uneven surfaces , with the help of image processing and open C.V training the robot to cut the grass in desired shape.

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