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SMART ROBOTIC LAWNMOWER

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Abstract— This system was a fully automated grass-cutting robotic vehicle powered by battery energy that also avoids obstacles and is capable of fully automated grass cutting without the need for any human interaction. The best lawn mower integrated with recent technological features would be one way to ensure a more attractive lawn at a cheaper price. This proposed smart lawnmower would be user-friendly and helpful to maintain a beautiful lawn with reduced manpower. This Robotic lawn mower is safe, reliable, and can do much more for us. The main idea behind this project is to cut the grass automatically using the Microcontroller in a cost-efficient manner.

Keywords— Arduino Nano,Ultrasonic sensor, DC Motor, 4-channel Relay Module.

1. INTRODUCTION

In the past and even until now, cutting of grasses in the education institution, sports tracks, fields, industries, hotels, public centers, etc. was done with a cutlass. This method of manual cutting is time-consuming because human effort is needed for the same. The self-powered objective is to come up with a cutter that is portable, durable, easy to operate and maintain. It also aims to design a self-powered cutter of an electrical source; a cordless electric grass mower. The heart of the machine is a battery-powered DC electric motor. The system used 12V batteries to power the vehicle movement motors as well as the grass cutting motors. The grasscutter and vehicle motors are interfaced with an Arduino family microcontroller that controls the working of all the motors. Here we have interfaced with an ultrasonic sensor for object detection. The microcontroller moves the vehicle motors in a forwarding direction in case no obstacle is detected. On obstacle detection the ultrasonic sensor monitors it and the microcontroller thus stops the grass cuter motor to avoid any damage to the object/human/animal whatever it is. The microcontroller then turns the robotic as long as it gets clear of the object and then moves the grass cutter in the forwarding direction again. The present technology that was commonly used for trimming the grass is a manually handled device. The device consists of a blade that is operated with the help of the motor, the power supply for the motor is by using the battery. The battery can be charged by using a power supply.

2. EXISTING SYSTEM

In the existing system, humans spend their time mulching the grass of their homes, education institution, sports tracks, fields, industries, hotels, public centers, etc. This task can be only semi-automated.So, we go for a novel proposed system.

3. BLOCK DIAGRAM

The project is implementedusing Arduino Nano, Ultrasonic Sensor, DC Motor, Four-Channel Relay Module.

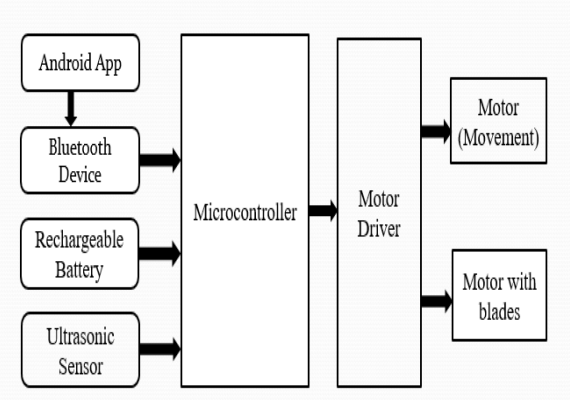


FIGURE 1: BLOCK DIAGRAM OF THE SYSTEM

4. METHODOLOGY

4.1 Arduino Nano

Arduino nano is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a mini-USB jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a mini-USB cable. You can tinker with your NANO without worrying too much about doing something wrong, in the worst-case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The UNO board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform and Arduino nano is very similar to UNO. (IDE = integrated development environment) The input voltage (7 – 12 V) to the Arduino

board when it's using an external power source (as opposed to 5 volts from the mini-USB connection). You can supply voltage through the Vin pin.

FIGURE 2: ARDUINO NANO

4.2 Ultrasonic Sensor

The ultrasonic transmitter emitted an ultrasonic wave in one direction and started timing when it launched. Ultrasonic spread in the air and would return immediately when it encountered obstacles on the way. At last, the ultrasonic receiver would stop timing when it receives the reflected wave. The distance of the sensor from the target object iscalculated.

FIGURE 3: ULTRASONIC SENSOR

4.3 DC MOTOR

Geared dc motors can be defined as an extension of dc motors. A geared DC Motor has a gear assembly attached to the motor. The speed of the motor is counted in terms of rotations of the shaft per minute and is termed as RPM. The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gearmotor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. A DC motor can be used at avoltage lower than the rated voltage. But, below 1000 rpm, the speed becomes unstable,and the motor will not run smoothly.

FIGURE 4: DC MOTOR

4.4 FOUR-CHANNEL RELAY MODULE

The **four-channel relay module** contains four 5V relays and the associated switching and isolating components, which makes interfacing with a microcontroller or sensor easy with minimum components and connections. There are two terminal blocks with six terminals each, and each block is shared by two relays. The terminals are screw type, which makes connections to mains wiring easy and changeable. The four relays on the module are rated for 5V, which means the relay is activated when there is approximately 5V across the coil. The contacts on each relay are specified for 250VAC and 30VDC and 10A in each case, as marked on the body of the relays.

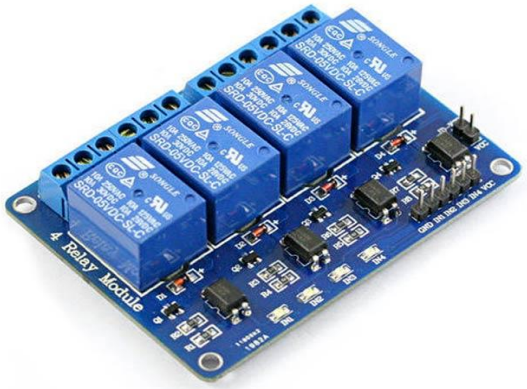
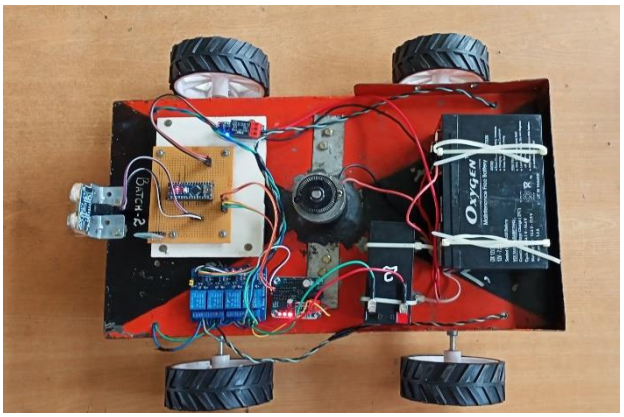


FIGURE 5: FOUR-CHANNEL RELAY MODULE

5. WORKING

In this system, the ultrasonic sensor is used to detect the obstacles in the work environment. The sensor is interfaced with the microcontroller. When it detects the obstacle, the lawnmower changes its direction. Two motors are used for the movement of the lawnmower. And a separate powerful motor is used for grass cutting. The motors are connected to a motor driver circuit. The microcontroller gets input from the ultrasonic sensor and commands the motor drivers and changes the direction pattern accordingly.

6. RESULT



7. CONCLUSION

The overall summary of the project work carried out and enhancement that will be implemented in the future is also discussed. This lawnmower will meet the challenge of the low cost of operation since there is no cost for fuelling. This automation also reduces the human effort and consequently the cost of the whole process. This project **"SMART ROBOTIC LAWN MOWER"** is specially designed with the hope that it is very much economical and this would be user-friendly.

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