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Automatic Lawn Mower using Renewable Energy Sources

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Abstract- *This paper proposes solar powered automatic lawn mower which is completely automatic in its operation and allows the user the ability to cut grass with marginal human efforts. Unlike other conventional robotic lawn mowers, this design requires no perimeter wires to maintain the robot within the lawn and also works with lesser human efforts in the manual mode of operation. This mower is proposing some pre-set pattern installed in the system, in the automatic mode of operation no human effort is needed for mowing and it also helps to cut different patterns in the lawn very easily within less time. Through an array of sensors safety takes major consideration in the device, this robot will not only stay on the lawn, it will also detect and avoid objects and humans [5].*

Keywords*—solar powered, human effort, pre-set pattern, objects and human.*

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I. Introduction

In this time, where newer technologies are aiming at reducing the pollution whereby maintaining the previous yield. We aim to provide such technology through our Lawn Mower which completely relies on Renewable energy (Solar). As far as machines with sharp blades are concerned, safety comes as a number one priority. This is the reason we have implemented an array of sensors which constantly communicates with the surroundings so that the machine works autonomously. We have also incorporated patterns for mowing such as spiral, rectangular, etc. and hence achieving accurate landscaping. Under current standards followed by conventional Lawn Mowers, an hour of usage of gasoline powered push mower will produce the same Hydrocarbons and Nitrogen Oxides (HC+NOx) as a car driven 257 miles, and the same CO as one driven 401 miles. To put it another way, assuming a car averages 40 miles per hour, a push mower produces more HC+NOx than six cars and the same CO [4]. This staggering numbers give an idea of the air pollution caused by conventional lawn mowers. These lawn mowers also cause noise pollution due to the presence of internal combustion engine. This project of a solar powered automatic lawn mower will relieve the consumer from mowing their own lawns and will reduce both environmental and noise pollution. This design is meant to be an alternate green option to the popular and environmentally hazardous gas powered lawn mower. Ultimately, the consumer will be doing more for the environment while doing less work in their daily lives [6].

II. Methodology

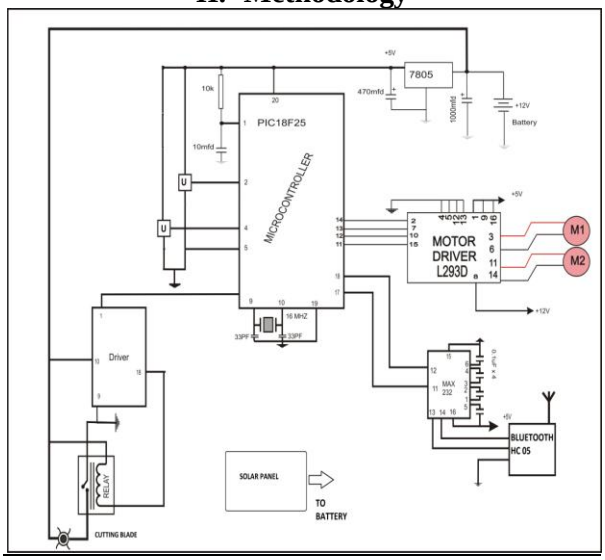

Figure1: Block Diagram of solar powered automatic lawn mower

This design contains a microcontroller, multiple sensors, and a solar charging system.

A. Voltage Regulator (IC 7805)

A regulated power supply is very much essential for several electronic devices due to the semiconductor material employed in them have a fixed rate of current as well as voltage. The device may get damaged if there is any deviation from the fixed rate. The AC power supply gets converted into constant DC by this circuit. By the help of a voltage regulator DC, unregulated output will be fixed to a constant voltage. The circuit is made up of linear voltage regulator 7805 along with capacitors and resistors. From giving an unchanging voltage supply to building confident that output reaches uninterrupted to the appliance, the capacitors handle elevated efficient signal conveyance [3].

B. PIC Microcontroller (18F25)

For any robotic system, the microcontroller is the heart and it's where everything comes together. This PIC microcontroller is ideal for low power (nW) and connectivity applications that benefit from the availability of three serial ports: FS-USB (12 Mbit/s), I²C and SPI (up to 10 Mbit/s) and an asynchronous serial port (EUSART). It also houses large amounts of RAM (1K byte Dual Port RAM + 1K byte GP RAM) memory for buffering and Enhanced FLASH program memory make it ideal for embedded control and monitoring applications [1][2].

C. Ultrasonic Sensor (HC-SR04)

The sensors are the eyes of our robot. Primarily, we had an idea what type of sensors we wanted to use. We wanted object detection; both humans and objects. In which case, we went with using an ultrasonic sensor to detect human movement and to detect if the robot was heading into an object. Safety is the main concern when designing a robot with blades. We wanted our robot not to start operating if it was being held in the air by the user. Knowing that the user would be randomly holding the robot we needed a sensor to detect orientation. We used another ultrasonic sensor to detect the distance of mower from the ground.

D. Solar Panel with Battery

To power the system there were many options. With recharging batteries, there are various chemistries but we decided to go with the one that work best with solar charging. The nickel-metal hydride (NiMH) was found to be the best because given a low charging current, it will not over charge. Sizing the battery will depend on what we are powering, specifically the motors.

E. Motor Driver IC (L293D)

A motor driver IC is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor Driver ICs are primarily used in autonomous robotics only. Also, most microprocessors operate at low voltages and require a small amount of current to operate while the motors require a relatively higher voltages and current. Thus, current cannot be supplied to the motors from the microprocessor directly. This is the primary need for the motor driver IC. Motor driver ICs act as an interface between microprocessors in robots and the motors in the robot. This IC is designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor [3].

The microcontroller is the heart of our project. The microcontroller is placed inside the robot to protect it from the natural elements such as stones. Determining where to place our sensors is crucial for the overall effectiveness of our design. The solar panelswere to be placed horizontal on the robot so as to achieve maximum sun exposure. The ultrasonic sensor will be mounted directly in front of the robot for effective obstacle detection.

III. Preliminary Design

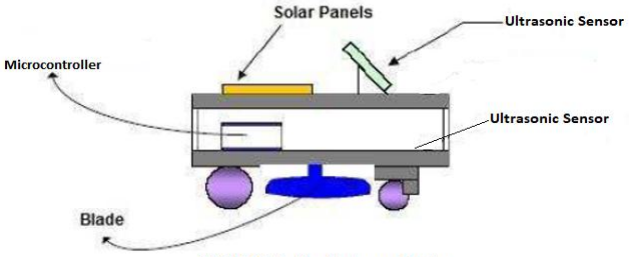

FIGURE 2– Preliminary Design

Another ultrasonic sensor is incorporated to stop the rotation of blade if robot is lifted above a certain level. The sensor that will be angled is the ultrasonic sensor because it also needs to detect humans and since the robot is at ground level it must be facing at a 45-degree angle to effectively detect human interferences. The motors responsible for movement of robot are of less RPM and capable of generating more torque as compared to that of motor controlling the rotation of the cutting blade, since the revolution of cutting blade should be sufficient so as to assure uniform cutting of grass.The preliminary design of the mower is shown in the above figure.

IV. Conclusion

With the ever increasing crowdedness in major cities many of the families are opting to buy a farm house outside the city to relax on weekends. It is quite common that this farmhouse has grass fields and since the family visits the farmhouse only at weekends or on holidays it becomes cumbersome to maintain this grass fields. Our design aims at solving such problems. The main focus of our device is its transportability, being a solar powered mower it is free of cables and wires. Thus the area of working has no limitations and could easily cover large fields. Moreover since it uses a renewable energy source it is environment friendly and doesn't cause any kind of air or noise pollution. Additional safety features are also incorporated in the lawn mower which makes it completely automatic so that the owner can switch on and leave the mower to perform its job without any supervision.

Acknowledgment

It gives us great pleasure in presenting the paper on "Solar Powered Lawn Mower". We would like to take this opportunity to thank our supervisor from Electronics Engineering Department, YCCE, Nagpur Dr. P. M. Palsodkar for giving us all the help and guidance we needed. We are really grateful to them for their kind support. Their valuable suggestions were very helpful.

References

[1] https://www.microchip.com/wwwproducts/en/PIC18F2455
[2] PIC18F Data Sheet.
[3] ElectronicsHub.org
[4] https://www.washingtoncitypaper.com/columns/straight-dope/article/13039806/straight-dope-how-much-pollution-do-gasoline-powered-lawn-mowers
[5] https://www.ijircce.com/upload/2017/may/152_SOLAR_IEEE.pdf
[6] http://www.researchpublish.com/download.php?file=Solar%20Powered%20Vision%20Based%20Robotic%20Lawn%20Mower-305.pdf&act=book

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