

Review Paper on Solar Powered Lawn Mower using Arduino

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Abstract— The grass cutter machines are becomes very popular today. Pollutions is manmade, which we can see in ours daily life. Old model of grass cutter IC engine are used and hence because of its environment impact pollutions level rise IC engine driven cutter is costlier. Maintenance of such conventional machines is very much. To avoid the drawbacks, we plan to make new types of grass cutter, which runs on solar energy, and this model is economical. The aim of our project is to makes the grass cutter, which operates on solar energy hence save the electricity and reduces work force. In this paper, we use microcontroller for controlling various operation of grass cutter. The grass cutter has been obstacle sensor for obstacle detection. Grass cutter operate automatic hence it does not require skill person to operate.

Keywords: Solar Powered Lawn Mower, Arduino Nano, DC Series Motor

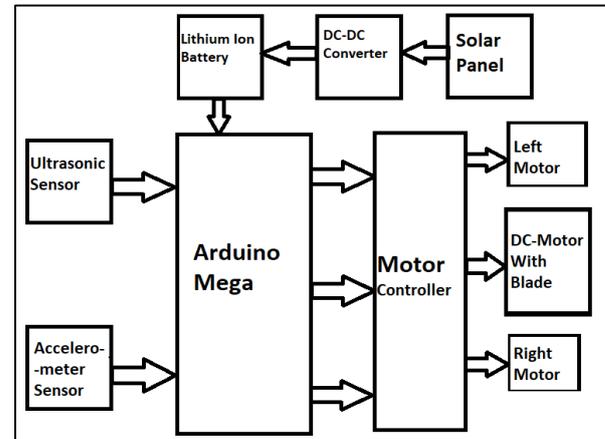


Fig. 1: Block Diagram for Lawn Mover

I. INTRODUCTION

A lawn mower is a machine that is used to cutting the grass in a lawn. The blades of the lawn mower are generally powered by pushing the mower forward. Lawn mowers are classified based on different criteria. For example, according to the axis of rotation of blades we may have reel lawn mowers (the axis is horizontal) and rotate lawnmowers (the axis is vertical). The lawn mower is found to be better. Made of blades on revolving cylinder, they achieves clean cutting by scissors actions. As the mower moves forward, the rotating blades come in contact with a stationary bar called the bed knife and placed parallel to the ground. The mower adjusted to various cutting heights. Either an internal combustion engine often powers rotary mower or an electric motor are generally mowers manually, with the engine only spinning the cutting blades. Rotary mowers are generally have opening by the sides of the housing through which cut grass are expelled. Some are attached with a grass collector at the exit points. Blade is seldom sharp enough to give a neat cutting point. The blade simply cut the grass resulting in brown tips. However, the horizontal blades are easily to remove and sharpen or replace. Again based on the energy sources we may have gasoline driven, electricity driven or hands driven lawn mower. Over the years, there have been numerous development in lawnmower technology. But, with technological advancement, there also arises the need to check the impact of machines on the environment as well as on man. Pollution is the major concern with the conventional gas powered lawn mower. Human effort are another factor that needs to be reduced. In this paper, we look at different mechanisms that have been innovated to increase efficiency of lawn mower operation and research development work going on in respective designs.

II. SOLAR POWERED LAWN MOWER MODELS

Solar Powered Lawn Mower Models Dipin and Chandrasekhar [1] studied solar powered vision based Robotic Lawn Mower. It shows the designs of a microcontroller and sensors based on robotic lawn mower mechanism. This robotic mowing device was solar powered and its battery gets charged from sunlight while mowing on the lawn or even manually. Ultrasonic sensors were used for avoiding obstacles and humidity sensor for checking humidity level in the lawn. Passive infrared sensor (PIR) was used to detect human interaction near the device in operation. Android smart phone was used for capturing images of the lawn as per requirement. These designs are targeted as an alternate green option against the popular but environment hazardous gas powered lawn mower. The design are built on a mobile robot, which communicates with a computer through a ZigBee module. The operator has created a GUI (Graphical User Interface) in MATLAB for the selection of cutting design/pattern of the lawn. Tanimola et al. [2] studies on designs and development of a solar powered lawn mower. They tried to achieve a solar powered lawn mower model that used solar energy with the help of a solar panel and solar photovoltaic cells to run an electric motor

The electric motors was coupled to the cutting blades. The photons from sun hit the photovoltaic cell and as a result, flow of electrons start leading to direct current. A 1.5 HP (Horse Power) motor is used and a 12 volt battery supply electric power to run the motors. They performs detailed analysis to estimate the torque produced in blades and whether it is sufficient to perform the intended job. In addition, stress analysis was performed for the frame and the handle of the lawn mower. After designs and development of the lawn mower, it was testing on four different species of grass. Satwik et al. [3] performed design, fabrication of lever operated solar lawnmower, and contact stress analysis of spur gears. They try to develop a height adjustable mechanism for

the cutting blades. The mechanism involves a pair of spur gears of different face width and a lever, which adjusts the rotor height such that the smaller spur gear slides on the face width of the larger spur gear. An Arduino boards was used to control the speeds of the rotor blades and obstacle detection. Solar panel receive sunlight and powers the battery, which in turn runs the motor. Battery and motor selections were done after design analysis of blades. Active stresses on the spur gears are calculated by using AGMA and Hertz equation and Finite Element Analysis.

III. DESCRIPTION

In this system, we have used the atmega 328 AVR microcontroller, four DC motor and driver circuits. In this project the system is been totally operated by solar energy. The main aim of solar-based grass cutter is to cut the grass in which farmer take too much hard working so we can reduce all that. There is one ultrasonic sensor which we have used for obstacle sensing when obstacle is detected the robot is stop and vice versa. Microcontroller continuously check the output of ultrasonic sensor and gives signal to the motor driver circuit, which drives the motors.

IV. COMPONENTS

A. Arduino Nano

We used Arduino Nano in this bot in order to increase the modularity of the bot and account for future modification. The major advantage of Arduino Nano is its capability to perform in such a small form factor. Also the programming languages used for Arduino is C, which is a very popular high-level language.

1) Technical Specification

- Microcontroller - AT mega 328
- Operating voltage-5v
- Flash memory - 32 kb
- Clock speed - 16 MHz
- Analog IN pins - 8
- PCB size - 18x45 mm
- PCB weight - 7 grams

B. L293d9 Motor Driver

This typical motor driver or motor driver ic which allows two DC motors to be driven in either directions. L293D9 is a 16 pin IC which can control asset of two DC motors simultaneously in any direction. It means that you can control two Dc motors in a single L293D9 IC.

1) Technical Specification

- Operating voltage- 5V
- Operating current – 3 amps
- Output current- 1.2 amps
- Dimensions – 44x37 mm

C. DC Series Motor

The speed controller works by varing the average voltage sent to the motor. It could do this by simply adjusting the voltage sent to the motor, but this an inefficient method. A better way is to switch the motor supply on and off very quickly. If the switching is fast enough, the motor functioning does not get affected; it only notices the average effect.

1) Technical Specification

- Operating voltage - 12V
- Operating current - 80 mA
- Rpm-60-80 rpm, 1000 rpm

V. RESULTS & CALCULATION

The capacity of the battery was 2000 mAh, discharging current was 1.2 amps, and the output of the solar panel was 12 v and 5 watts. The discharging time was calculate by dividing the battery capacity by the discharging current. The discharging time was 2 hours approximately.

Using the formula $E=VIT$, we calculated the charging the time which was approximately 4 and a half hour.

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