

Wireless Remote Controlled Grass Trimmer

Varun N.V¹, Vinay kumar P², Sachin S³, Santhosh Reddy K.V⁴, Anand S.N⁵

^{1, 2, 3, 4}Dept of Mechanical Engineering

⁵Asst. Professor, Dept of Mechanical Engineering

^{1, 2, 3, 4, 5}Reva University

Abstract- In Today's world People are giving more preference for clean and healthy environment around them. So, the maintenance of the lawn is also one of the influencing factor. Therefore, we have made an attempt to come up with a concept of Remote operated grass trimmer(Automation) to make the maintenance simple and quick and to give the aesthetic look for the surrounding environment. With this concept we can also reduce the human effort in two ways: 1) A person need not to move along with the grass trimmer for directing it in a field. 2) A person needs not to collect the grass after cutting it. Addition of Solar Panel makes the grass trimmer to work for some more time, as it will be automatically charged continuously.

Keywords- Grass trimmer, lawn mower, remote control, solar power.

I. INTRODUCTION

A grass trimmer is a machine that uses one or more revolving blades to cut a lawn to an even height. The blades will be powered by an electric motor or an internal combustion engine. The first lawn mower was invented by Edwin Budding in 1830 in Thrupp, just outside Stroud, in Gloucestershire, England. Budding's mower was designed primarily to cut the grass on sports grounds and extensive gardens, as a superior alternative to the scythe, and was granted a British patent on August 31, 1830. A robotic grass trimmer is an autonomous robot used to cut lawn grass. Automated solar grass cutter are increasingly sophisticated, are self-docking and some contain rain sensors if necessary, nearly eliminating human interaction. Robotic grass trimmer represented the second largest category of domestic robots used by the end of 2000. Possibly the first commercial robotic lawn mower was the MowBot, introduced and patented in 1969 and already showing many features of today's most popular products. In 2012, the growth of robotic lawn mower sales was 15 times that of the traditional styles. With the emergence of smart phones some robotic mowers have integrated features within custom apps to adjust settings or scheduled mowing times and frequency, as well as manually control the mower with a digital joystick.

Types of grass trimmer:

1. Rotary lawn mower.
2. Gasoline mower.
3. Electric lawn mower.
4. Robotic mower.
5. Hover mower.

II. LITRATURE REVIEW

1. Srishti Jain et al.

This paper proposes solar powered vision based robotic lawn mower which is an autonomous lawn mower that will allow the user to cut the grass with minimal effort. Using an array of sensors safety takes major consideration in the device, this robot will not only stay on the lawn, it will avoid and detect objects and humans. Power is supplied both to the cutting blades as well as to the wheels. A closed loop control system is implemented in this model.

2. E. Naresh et al.

In this paper they have taken the existing model and started redesigning the complete system by adding the solar panel and changing the blade arrangement. The system is similar to the present lawn mower where a solar panel is an additional part. The effort of the system is not amplified just the speed of the blade is increased by using the gear arrangement. Power is supplied to the cutting blade but for the movement of the complete system a human effort is definitely required. In this system the after the grass is cut again human intervention is required for the collection process.

3. Ms. Yadav Rutuja A et al.

In this Paper, they were mainly concentrating on use of Renewable energy (Solar panel) as a Power source for the operation of motors, which are used for the movement of Lawn cutter and for the rotation of cutting tool motor and to make the Automation in this project. In addition to this they were used sensors to find the obstacle and to take its own decision by moving other side. A Battery is also connected to this to overcome the problem of shortage of Power. This is mainly a Daily basis work will be done. The inverter is

connected to convert DC power to AC power, which is from DC battery to the AC motor.

4. Dutta P etal.

In this paper they have made a technical review of lawn mower technology. They found that different types of lawn mowers have their own merits and demerits. In solar powered lawn mower type, they found that solar power alone cannot provide the necessary power required to drive the motor. Where as in electrical lawn mower the efficiency is more and speed cutting of grass can be done. And in Robotic lawn mower they use closed loop program to run the lawn mower, where the lawn mower can work without human intervention and sensors were used to detect the obstacle and to move side, this work on daily basis. In all this types of lawn mowers none were designed to collect the grass, this can be the limitation of all this lawn mowers.

5. Harbhinder Singh and Jaswinder Singh Mehta.

In this paper they have made the design of lawn cutter and found the different forces and stress acting on the chaises using ANSYS. They connected the battery on top of the chaises. They have used the receiver and transmitter to make the lawn mower as remote controlled. As the authors says that this mower is heavier, harder and low speed cutter. This is simple in design and operation of this mower.

6. Rohan Patil etal.

In this paper there main aim is to design, Development and Fabrication of solar operated lawn cutter machine. They wanted to increase the efficiency of solar operated lawn cutter by increasing the number of solar panel, so that they can get more electrical power. This is simple in design, development and fabrication. This lawn mower is bigger in size and manual operated lawn cutter, there is no automatic grass cutter. This mower requires high voltage and current about 12V and 7.5A. This is a modified design of solar lawn cutter.

III. PROBLEM STATEMENT

The trimmed grass requires in different sizes of length for different types of application. The grass trimming is the major operation performed in sports ground, parks, agriculture, and to perform this operation for large area, the man power is required which results in to high cost, more time required to complete the operation, affect the accuracy. So for automation in this system we are trying to do a work on new automatic grass trimmer. This paper proposes an approach that aims to provide the automatic grass cutter with collector

without consuming any extra power for collecting, with adjustable cutting height, solar powered. By manipulating grass trimmer, man power is drastically reduced. The electric supply can be recharged continuously by solar energy. Automatic collector reduce the man power.

IV. DESIGN METHODOLOGY

Initially our design work started by rough sketching of grass trimmer on a page. The next step was implementing the thoughts on paper through a 3D model design. This model was further checked and analysed for failure. Once the model was feasible in design and design was finalized for fabrication.

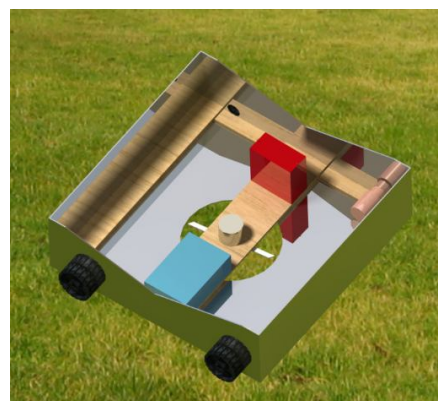


Fig1: 3D model of grass trimmer

The lawn trimmer that we fabricated consist of cutting blade, base frame, sheet metal, dc motor, arduino, drivers, transmitter, receiver battery and solar panel. The setup is connected to a 12 volt, supply to run wheel and cutting motors. An external 9 volt battery is required to power arduino.

V. COMPONENTS OF WIRELESS REMOTE CONTROLLED LAWN CUTTER

A. BASE FRAME:

Here the base frame is made up of nylon square rod. The main use of this is to support the overall structure and to hold the major parts like, Driving motor and wheel. The main advantage of using nylon square rod is that it is having low density and good strength, as required for our design.

B. SHEET METAL:

Sheet metal is used to make the overall structure of the grass trimmer including collecting bin and housing for electrical circuits. The main advantage of sheet metal is that it is having good corrossive resistance and flexibility.

C. DC MOTOR/ DRIVING MOTOR:

High torque DC motors (2nos.) are used to drive the grass trimmer and low torque DC motor (1nos.) is used to trim the lawn to an even height. Use of brush less motor for trimming grass will be more effective.

D. ARDUINO

The main reason of using arduino is to control the speed and direction of motors. To make the desired working of arduino one has to write a program to control it.

E. DRIVERS:

A motor controller might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, regulating or limiting the torque, and protecting against overloads and faults.

F. TRANSMITTER & RECEIVER:

In electronics and telecommunications, a transmitter or radio transmitter is an electronic device which produces radio waves with an antenna. The transmitter itself generates a radio frequency alternating current, which is applied to the antenna. When excited by this alternating current, the antenna radiates radio waves. Receiver is an electronic device that receives radio waves and converts the information carried by them to a usable form. It is used with an antenna. The antenna intercepts radio waves (electromagnetic waves) and converts them to tiny alternating current which are applied to the receiver, and the receiver extracts the desired information.

G. BATTERY AND SOLAR PANEL:

Battery is device, which consists of one or more electrochemical cells with external connections provided to power electrical devices. It has two terminals positive terminal as cathode and negative terminal as anode. It works on the principle of electrochemical reaction. Batteries capacity is the amount of electric charge it can be deliver at the rated voltage. We are using lead acid battery. It is a type of rechargeable battery.

H. CUTTING BLADE:

These cutting blades (2nos.) are the main reason for cutting of grass. These blades are made up of stainless steel. The blades should be minimum of 1mm to 2mm thick to withstand the various shocks in cutting of grass.

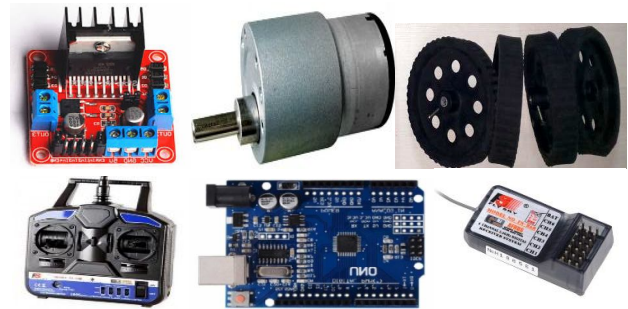


Fig2: Components of grass trimmer.

VI. FABRICATION PROCESS:

A. PURCHASE OF REQUIRED RAW MATERIAL:

This is the second phase of our project after knowing the detailed design of the lawn trimmer. We have purchased raw materials based on our requirement as per the theoretical calculations.

B. FABRICATION OF FRAME AND OVERALL STRUCTURE:

As weight is a major parameter, we have chosen nylon as a supporting structure which acts as a chassis for the complete system. It carries the overall structural weight of the lawn mower. As per the design the structure is been made in a rectangular shape and all the sides have been covered using sheet metal which also acts as a collector bin.

C. ASSEMBLING THE PARTS TOGETHER

In the assembly process the base frame is taken and the motor with the wheels have been placed on the structure and aligned based on required parameters. This enables the driving mechanism.

For the trimming operation we have placed a motor with cutting blades in vertically downward direction which is positioned at the center of the structure. Which enables the trimmed grass to collect automatically.

D. INTERFACING MECHANICAL COMPONENTS WITH WIRELESS NETWORKING SYSTEM:

After the fabrication process, based on the required operations of the lawn mower and considering the specification of transmitter and receiver the programme has been done. This programme is fed to the microcontroller. It is interfaced with the receiver and motor driver. When transmitter sends the signal, microcontroller processes the signal obtained from the receiver, which enables the movement of the wheels with motor through the motor driver. This complete system enables the driving mechanism.

VII. PERFORMANCE TEST

1. Total area under consideration = $4 \times 4 = 16m^2$
2. Obtained trimmed area = $14m^2$
3. Obtained duration for cutting of grass is 11 minutes 54seconds
4. Efficiency =

Obtained area/total area X100
 $= 14/16 \times 100 = 87.5\%$

VIII. PERFORMANCE TESTGRAPH:

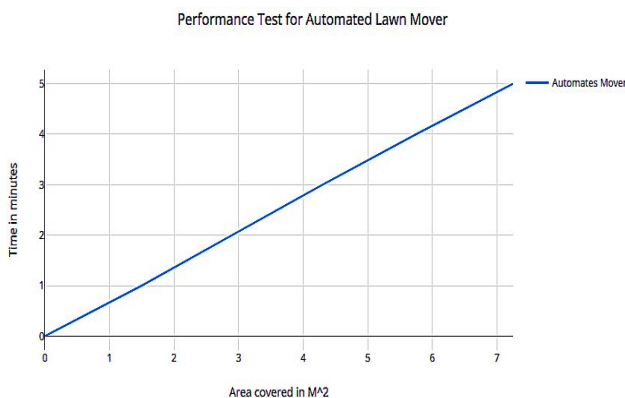


Fig3: Graph of Time taken v/s Area trimmed

DISCRIPTION:The above graph represents the performance of the system. We have plotted the graph (TIME TAKEN V/S AREA TRIMMED), which depicts the amount of grass area trimmed in a particular time interval. So based on this we can conclude the time required to cut large areas. The linearity of the graph indicates no time delay and maintains the same efficiency through out the cutting process.



Fig3: Assembled grass trimmer

IX. CONCLUSIONS

1. The designed Wireless Remote controlled lawn cutter is working effectively up to 87.5% as it is expected.
2. The Designed lawn mower is simple and quick in operation. (Automation)
3. This wireless Remote controlled lawn cutter reduces the human effort as compared to manual lawn cutter.

REFERENCES

- [1] Self-Efficient and Sustainable Solar Powered Robotic Lawn Mower Srishti Jain, Amar Khalore and ShashikantPatil, Department of Electronics and Telecommunication Engineering, SVKMs NMIMS, Mumbai, India International Journal of Trend in Research and Development, Volume 2(6), ISSN: 2394-9333.
- [2] Grass Cutting Machine by Solar Energy PowerE. Naresh, Boss Babu&G.Rahul, B.Tech (Mechanical Engineering), Hyderabad Institute of Technology and Management Hyderabad, Telangana, India. International journal and magazine of engineering, Technology, Management and Research. ISSN No: 2348-4845.
- [3] Automated Solar Grass CutterMs. YadavRutuja A., Ms. ChavanNayana V., Ms. Patil Monika B., Mr. V. A. Mane Research Scholar, Assistant Professor Department of Electronics And Telecommunication engineering. AnnasahebDange Collage Of Engineering Technology. Kolhapur,