# Lawn Mower – An Automated Machine

**Neha Bhateja, Nishu Sethi, Shefali Jain, Yash Mishra**

**ABSTRACT-** Robotics is a branch of engineering that combines more than one area of research and is used to design machines that helps us to assist in our day- to-day life. There are various inventions existing that are created using robotics and lawn mower is one such inventions. Lawn Mower or lawn cutter is a mechanical device whose work is to cut grass in our lawns. The automated lawn mower is used to do the same task automatically with help of different sensors and electrical components. This review aims to evaluate the technology that has been not used still to make the system more advanced. This paper presents the currently based system and techniques and retouches the areas that need to be modified for better performance.

**KEYWORDS**- Robotics, Lawn Mower, sensors, electric components.

## I. INTRODUCTION

A lawn mower is a machine that uses a moving blade to cut a grass surface to an even height. The concept of lawn mower and the first lawn mower was developed by Edwin Budding in 1830 in England. Lawn Mowers can be classified into various categories [1] depending on their functionalities. For example, lawn mower based on axis of rotation blades we have reel lawn mower and rotary lawn mower. Initially, Blades were utilized to cut the lawn and then manual lawn mowers introduced but engine is not used in manual mowers [11] [12] developed a solar grass cutter robot which worked by utilizing solar energy. Automated lawn mowers use automated techniques to cut the lawn grass. They are made by integrating various electric components to work as a single device.

**Manuscript Received November 17, 2020**

**Neha Bhateja**, Assistant Professor, Department of Computer Science & Engineering, ASET, Amity University Haryana, Gurgaon, India, 9560131074, (email: nbhateja@ggn.amity.edu)

**Nishu Sethi**, Assistant Professor, Department of Computer Science & Engineering, ASET, Amity University Haryana, Gurgaon, India.

**Shefali Jain**, Student, Department of Computer Science & Engineering, ASET, Amity University Haryana, Gurgaon, India

**Yash Mishra**, Student, Department of Computer Science & Engineering, ASET, Amity University Haryana, Gurgaon, India

Automated lawn mowers are more efficient than existing lawn mowers that requires minimal human interaction. There are different mechanisms that are introduced to enhance the efficiency of automated lawn mowers. [13] further with development of electrically motored power lawn mower, electric lawn mower cannot be simply operated and are also dangerous. Also, since electric lawn mowers used cords for their functioning, so mowing becomes difficult and complex. The purpose of this study is to design and implement an automatic lawn mower which can automatically cut the lawn grass. This lawn mower gets power from a rechargeable battery. The user of the robot has to set basic functions like switching power on or off. The presence of different sensors makes the robot more efficient and safe for its surroundings. The system is adaptable to different changes as per the requirements and functionality. The paper is divided into different sections as follows: section I gives the introduction, section II contains literature review that describes related work that have been done in the field till now, section III contains conclusion and future scope for the proposed system and section IV contains the references.

## II. LITERATURE REVIEW

Ajibola et.al [2] give information about solar powered automated lawn mower. The system contains components like diodes, sensors, DC motors and solar panel. The above discussed system was a combination of a robotic car and a lawn cutter. All the components were connected as shown in figure 1.
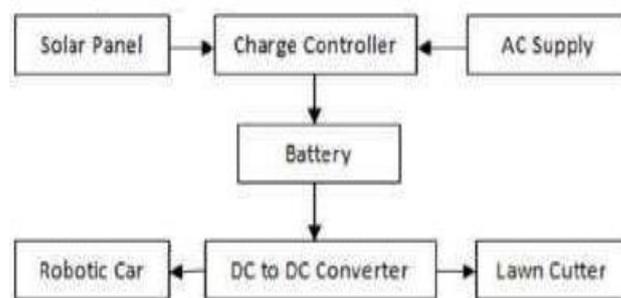


Fig. 1: System block diagram [2]

The system when switched on requires user to input the dimension of the lawn that has to be mowed. This method was ok for lawns with small size but not beneficial for larger size lawns. The size of wheels used was so small that could not roll properly on the surface of the lawn. It was also observed that the cutter was not able to cut grass properly where there was high grass density due to small

size of the blades. Amar Khalore et.al [3] that was able to cut the grass automatically. They first designed remote controlled lawn mower. The system once completed was adapted to operate automatically. The bot was solar powered and used components like ATMEGA 328, motor drivers, solar panels, IR sensors etc.

Figure 2 (a) and Figure 2 (b) shows the block diagram and final robot respectively.
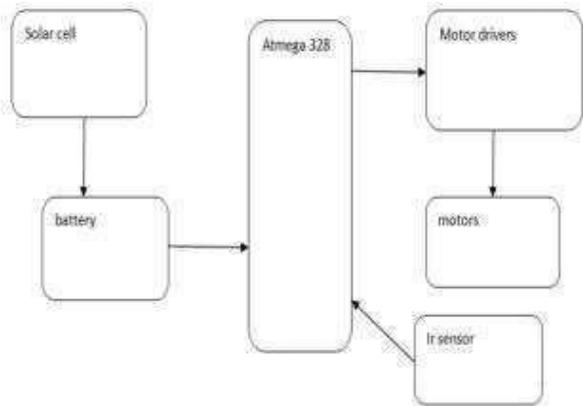


Fig. 2 (a): Block diagram for proposed system [3]



Fig. 2 (b): Final robot [3]

B. Vaikundaselvan et.al [4], proposed a prototype of an automated lawn mower that worked on charged batteries with cordless features to eliminate the interference to the operation. The prototype was remote controlled that helped the robot control its movement and to keep it within the boundaries of the lawn. The RF module was used in constructing the wireless remote for transmission and receiving functions of the robot. Darwin Ramos et.al [5], designed a prototype "Lawn Buddy" a solar powered lawn mower. The design uses various sensors like PIR sensor, Ultrasonic sensor, Accelerometer for safety purposes. This prototype was to use array of sensors to keep the robot within the lawn and to detect objects. However, the prototype never came into existence due to financial constraints.

Firas B. Ismail et.al [6] introduced a new design which was titled as Smart Solar Grass Cutter. This was designed to decrease air pollution and enhance the current prototype precisely the blade position. This design contains Arduino UNO. The hand sketched digitalized diagram for smart solar grass cutter is shown in figure 3.
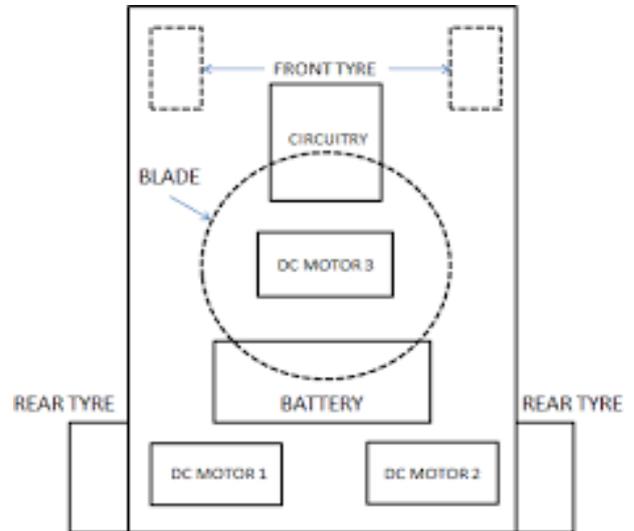


Fig. 3: Smart solar grass cutter [6]

Arduino Board, Bluetooth module and other electrical components were used in circuit. Three DC motors were used two for rear wheels and one for the blades. The front wheels located below the main body were used for rotating rubber tires. Ketaki Kiran Hulgeri et.al [7], gives information about Autonomous Grass Cutting robot which was Solar Powered. The system contains components like IR Proximity sensor, DC motor, LCD display, IR Remote, IR decoder, Color Sensor. The main purpose of this controller is to check the area which is cut and further defined the height of the grass as per the user's requirement by the use of Infrared sensor. Block diagram for the discussed system is shown below in figure 4.
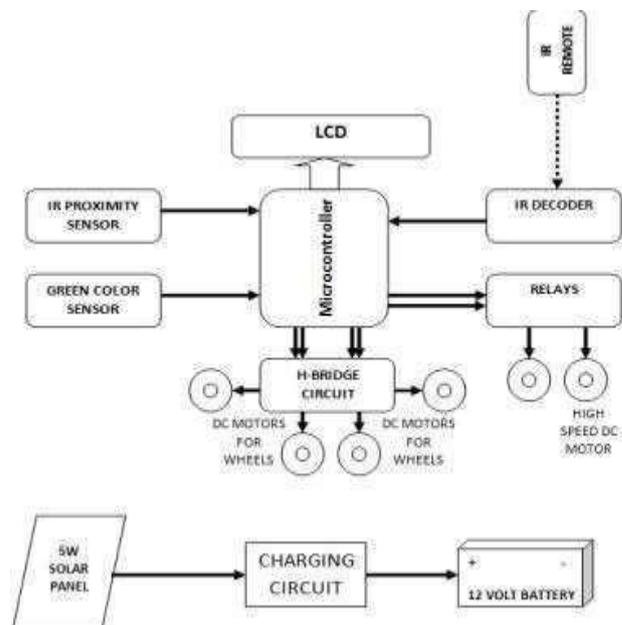


Fig. 4: Block Diagram Autonomous grass cutter [7]

The use of microcontroller makes the system cheap and implementation becomes easy. This light weight portable machine is also provided remote control system to work as automatically as well as manually. Another feature of this system is not necessary to give instruction to move the robot manually, it automatically move by using green grass sensor and cut the existing grass. Muhammad Wasif [8] in his paper describes the Design and Implementation of Autonomous robotic lawn mower. The system contains components like camera, sonar, optocouple sensor and GPS. To perform in unknown environment system uses "sense act approach". This system was implemented using a Motor Schema Architecture, that encoded responses continuously for coordinating behavior of the system. Optocouple sensor is used for identifying mown or unmown grass. In this behavior based lawn mower, author proposed the design of this system to complete the given task in a dynamic and unstructured environment, which is basically unknown for the robot. To overcome the problems of moving obstacles, cameras can be used for obstacle detection. Patil Monika B. et.al [9] proposed design of automated solar grass cutter. The main elements of the grass cutter were solar panels, batteries, DC motors, solar charger and blades. This design will be useful for eco-friendly and pollution free environment. By using solar panels, electrical energy was obtained by converting solar energy to electric energy and then by using solar charger, electrical energy was consumed in batteries. Figure 5 shows the block diagram for this system.
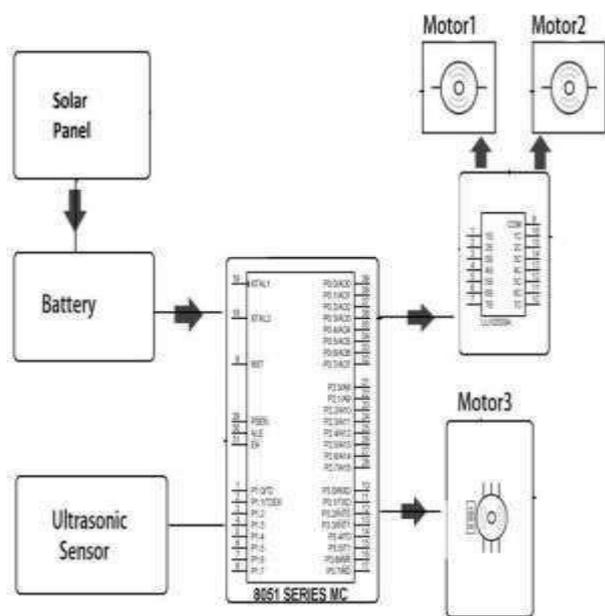


Fig. 5: Block Diagram for solar grass cutter [9]

S. George Fernandez [10] aimed to design an automated lawn mower. This was a solar powered automated lawn mower which can cut the grass automatically and provided features like detecting and avoiding small obstacles such as stones or animals by use of ultrasonic sensors. Arduino Nano was used as the brain of the robot and was coded in C language. ATmega 328 was the microcontroller used for the robot with operating voltage of 5v. The system used LDR (Light Dependent Resistor) for detection of the boundaries of the lawn which were marked by laser lights.

## III. GAPS

- The system designed earlier used solar energy to power the robot. The functionality was dependent on availability of sun.
- The designed system did not use perimeter wire for detection of boundaries.
- The robot was not able to work properly where the grass density was high due to low height of the robot.

## IV. CONCLUSION

From the above discussion, it is observed that there are many existing systems for doing the lawn cutting work. However, a little work is to be done to modify the design and enhancements of features to make the robot more efficient. So, this study aims to design an automatic lawn mower using Arduino. The design when completed and implemented will be able to cut the lawn grass automatically with all safety parameters. The design is adaptable for modifications and enhancements as per the requirements of the user. The design is portable and can be used at homes, institutions and industries. For future scope we can add features like cleaning the lawn simultaneously while cutting the grass, providing blade change information at regular intervals of time, controlling the robot remotely.

## V. ACKNOWLEDGMENT

## VI. REFERENCES

[1] Dutta P.P, Baruah A, Konwar A and Kumar V, "A technical view of lawn mower technology", ADBU-Journal of Engineering and Technology.

[2] Ajibola Olawale O.E. and Sunkanmi Olajide, Member, IAENG, "Design and Construction of Automated Lawn Mower", 2019.

[3] Amar Khalore, Srishti Jain and Shashikant Patil, "Self- Efficient and Sustainable Solar Powered Robotic Lawn Mower", IJTRD 2015.

[4] B. Vaikundaselvan, M. Ramkumar, P. Ranjith, T. Ragavender and S. Hariharam (2016), "Design and Implementation of Autonomous Lawn Mower", IJRTER 2016.

[5] Darwin Ramos and Jessie Lucero (2009), Solar Powered Automatic Lawn Mower "Lawn Buddy".

[6] Firas B. Ismail, Nizar F.O. Al- Muhsen, Fazreen A. Fuzi, A. Zukipli, "Design and Development of Smart

Solar Grass Cutter", International Journal of Engineering and Advanced Technology (IJEAT), 2019.

[7] Professor Rohini P. Onkare, Pradnyadevi Jagannath Pawar, Ketaki Kiran Hulgeri, Sanket Dasharath Gurav, Gurav, "Solar Powered Autonomous Grass

[8] Muhammad Wasif, "Design and Implementation of Autonomous Lawn Mower Robot Controller", IEEE 2011.

[9] Ms. Patil Monika B., Ms. Yadav Rutuja A., Ms. Chavan Nayana V., Mr. V. A. Mane, "AUTOMATED SOLAR GRASS CUTTER", IJSDR 2017.

[10] S. George Fernandez "A Fully Automated Lawn Mower Using Solar Panel", Journal of Advance Research in Dynamical & Control Systems, Vol. 10, 2018.

[11] A. Rithvik Reddy, N. V. Chaitanya, Abhishek, A. Suvarnamma, "Autonomous Solar Based Lawn Mower", International Journal of Pure and Applied Mathematics, 2018.

[12] G. Manoj Kumar, G. Sravanthi, J. Ankamma Chowdary, D. Aparna, V. Ajay Kumar, "Solar Grass Cutter Robot with Obstacle Avoidance", IJESC 2017.

[13] Varsha D, Vasavi Suresh, Prasad Hegde, Satish Balachandra Gummani, Anil Kumar PR, T Venkategowd, "Design and fabrication of remote controlled lawn mower", International Journal of Advanced Engineering and Technology (IJAET), 2018.