



Design and Fabrication of Fully Automated Lawn Mover

¹S. Hema Prasad, ¹P. N. N. M. Prakash, ²S. Neeraja, ³S. Balu, ⁴P. Navya, ⁵S. Sai Prasad, ⁶P. Naga Sekhar, ⁷P. Bhargav, ⁸Dr. A.Lakshumu Naidu

^{1,1,2,3,4,5,6,7}B.Tech Students, Dept. of Mechanical Engineering, GMRIT, Rajam, Andra Pradesh., India

⁸Sr.Assistant Professor, Department of Mechanical Engineering, GMRIT, Rajam, Andra Pradesh, India

ABSTRACT:

Grass cutter machines have become extremely common right now. The greater part of the times, grass cutter machines are utilized for delicate grass cutting. Programmed grass cutting machine is a machine which going to achieve the grass cutting activity by its own. This model lessens both climate and contamination. This battery of 12 Volts oriented Grasscutter intended to cut grass in places like parks, lodgings, public spots, and so on. The Grasscutter is planned through Internet of Things innovation, which is controlled through Bluetooth module. The proposed model comprises of equipment parts like nodemcu module, bldc 24v e bike moters, ESP32-CAM, ESP32S Development Board, OV2640 Camera Module NodeMCU, 12v batters 2, Sprockets & bearings. The planned model is modified nodemcu module to control the activity of the Grasscutter. The control instrument and developments, for example, Positive progress, In reverse development, Right development, left development, On component, Off system and Stop capability for the Grasscutter model. A ultrasonic sensor associated with the top of the model evades the framework from slamming into snags while in development. Grasscutter model's controls and advances, such as Positive progress, Reverse progress, Right progress, Left progress, On component, Off system, and Stop capability.

Keywords: Internet of things(IoT), NodeMCU specs, DC-motor.

INTRODUCTION:

Presently in many spots like a foundation, association, sports ground, ventures, inn, public focus and so on, cutting of grasses was finished with a cutlass. This manual technique is tedious and incorrectness level of cutting is noticed. With the advent of innovation, grass cutting was completed with one or more sharp edges to level the grass surface. Typically, a switch or nut adjusted in line with the machine wheels will vary or fix the level of grass cutting from the administrator end. This cuts the grass in a remarkably short amount of time and also raises the level of human power input. A variety of grasscutter types are available depending on one's needs to assist in finding the ideal grasscutter. Indeed, when deciding on the right tool for the client end, the power hotspot for the grass shaper plays a crucial role. Innovation arranged chopping down the grass has been executed taking on present day energy sources, for example, petroleum, power, propane and so on.

METHODOLOGY:

In the proposed model, The brain of the device is the node mcu. Every part of the machine receives instructions from it on how to move or change directions. The OV2640 camera module on the lawn mover can observe and detect any type of impediment, sending the information to the node mcu. The cutting blade is of the flat kind, which is extremely light and sharp. Two 24 volt electric bike motors that are attached to each side of a pair of wheels and are powered by an amaron 12 volt battery perform the movement function. The wheels on either side of the vehicle can be moved or rotated in the opposite direction of the shaft axis to turn the vehicle right or left.

LITERATURE:

Numerous number of researchers have been carried by the different researchers in the relevant field. The summary of the outcome of the re-searchers have listed below:

2.1 Fully automated lawn mover

A lawn mower, often known as a mower or lawnmower, is a piece of equipment that uses one or more rotating blades to cut grass at a uniform height

Design of chassis:-

Frame and other parts like a nodemcu, camera module, batteries, wheels, and motors make up the majority of a chassis. Aluminium of the ideal thickness and low weight makes up the frame. In order to carry the weights of other components and the gathered turf, stress concentration is evenly distributed[1]. Wheels are positioned such that they distribute the load uniformly. The height of the cutter can be adjusted by the chassis for desired cutting or cutting in an attractive way..

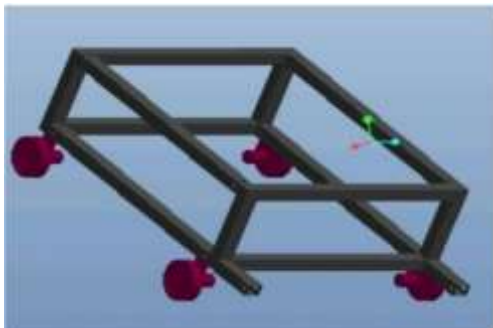


Fig:-1 pre model of chassis [2]



Fig 2:- The real chassis of grass cutter

The mower's flat blade shape allows for very precise mowing of the grass. Lawn mower power consumption has decreased due to design optimisations. The cost is also lower because the chassis is built simply. When mass produced, the price will be considerably lower. The mower is also effective when used commercially on expansive lawns.

2.2 Automatic Iot lawn mover

The fully automated lawn cutter is a robotic device that cuts grass while avoiding obstacles and working without the assistance of a human operator. It uses node mcu to accomplish this. The bot's lawn cutter motor and vehicle movement motors are both powered by 12V batteries[3]. The cutter and vehicle motors are interfaced with the node mcu, which manages the functioning of all the motors. It also interfaces with an ultrasonic sensor to detect impediments. The microprocessor moves the vehicle motors forward if no obstacles are found. The microprocessor then stops the lawn mower engine to protect whatever the object, person, or animal is, while the ESP32 cam maintains note of any impediments it encounters. The vehicle is rotated by the node mcu specifications once it has passed the obstruction, and then the grass cutter is dispatched forward once more. With the help of this project, the user won't have to move their own lawns, which will reduce noise and environmental pollution. Consumers will eventually put in less work each day and contribute more to the environment. The Lua scripting language is used by NodeMCU to communicate with the ESP8266 microcontroller. It may be developed in the lightweight programming language Lua, which is simple to learn. The built-in libraries in the NodeMCU firmware make it simple to access Wi-Fi networks, read and write data to the internet, and manage GPIO pins. The lightweight scripting language Lua, which is simple to learn, can be used to easily programme the firmware.[4-6]

It will be easier for those who take on the project for more alterations. Because it comes with more advantages, such as running on batteries and not needing gasoline, producing no pollution, or utilising any fuel at all, this idea is better suitable for the common person. Also, because there are fewer moving parts, there is less wear and tear. This will greatly enhance how much activity each person gets, and it's manageable.

2.3 SHREWD AUTOMATED RIDING MOWER WITH LAWN COVERAGE

These days, grass cutter machines are all the rage. Soft grass furnishing uses the majority of common machineries.[7]. There is a lot of development work going on right now. It has been unfinished yet there is still some labour force that requires a large income distribution for a small amount of work. Hence, it is frequently necessary that some tasks offer alternate solutions in order to reduce labour wastage.

S.No	Items	Quantity	Remarks
1	Dc motors	2	To drive the wheels with sprocket and chain
2	Wheel	4	Moving of machine
3	Battery	2(12 volts each)	To power supply for motor drives to rotate blade
4	Node MCU	1 (micro controller ESP8266)	To give command to the other components as per the information by the cameras.
5	Ultrasonic sensor	1	To detect obstacles
6	IR Camera	1	To detect whether the obstacle to cut or not.

Robotics is a very broad field with a variety of technological combinations that can reduce human effort and offer the most cost-effective solutions.[8]

Currently, a lot of energy is wasted mowing fields in many parts of the world, and the activity also requires a lot of human labour.

2.4 Automated mover robo

Nobody enjoys moving the lawn cutters when they are powered by a normal motor since it is a hassle.

For the working of blade and its adjustment mostly based on batteries and aurudinos.

Here ,the batteries are power supply ,node mcu control the motor drives which controls the blade.

1) Battery:-

Grass cutter that is designed to run on a 12-volt battery, using two 12-volt batteries in parallel would effectively double the capacity of the battery bank, but the voltage would remain the same at 12 volts.

When two 12-volt batteries are connected in parallel, the positive terminals of both batteries are connected together, and the negative terminals are also connected together. This means that the voltage remains the same, but the overall capacity of the battery bank is increased, allowing for longer operating time before the batteries need to be recharged.[\[9-10\]](#)

It's important to note that connecting batteries in parallel requires that they have the same voltage and capacity, and that they are both fully charged before being connected together. If the batteries are not identical, their different capacities could lead to one battery overcharging and being damaged, while the other battery is undercharged and unable to provide enough power.



Fig 3:- 12 V amaron battery

2.5,6 Grass cutter with flat blade

This smart lawn mower that will allow the user to the ability to cut the grass with less effort.By the working of parts like DC motors ,node mcu, ultra sonic sensors and a flat blade.[\[11\]](#)

Node mcu:-

NodeMCU is a popular development board based on the ESP8266 WiFi chip, which is commonly used for Internet of Things (IoT) projects. It has built-in Wi-Fi connectivity, which allows it to connect to the internet and other devices wirelessly.In the commanding a grass cutter, NodeMCU can be used to remotely control the grass cutter by sending commands over Wi-Fi. For example, you could use NodeMCU to turn the grass cutter on or off, change its direction or speed, or even program it to cut the grass in a certain pattern or at specific times.[\[12\]](#)

By using NodeMCU to command the grass cutter, you can make the process of cutting grass more efficient and convenient. You can control the grass cutter from a distance without having to physically be there, which can save time and effort. Additionally, by automating the grass cutting process, you can ensure that the grass is cut at regular intervals, which can help to maintain the health and appearance of your lawn or garden



Fig 4:- Node mcu ESP8266

OV2460 Camera module:-

The OV2460 camera module is a small, low-cost camera module designed for use in mobile phones and other compact devices. It can capture still images and video up to a resolution of 1920x1080 pixels at 30 frames per second

The OV2460 camera module in an automated grass cutter with a NodeMCU board, you need to interface the camera module with the NodeMCU board and write software to control the camera and capture images.

To interface the camera module with the NodeMCU board, one need to connect the camera module to the NodeMCU board using the appropriate interface[13-14]. The OV2460 camera module uses a standard 24-pin FPC connector, which can be connected to the NodeMCU board using a suitable adapter board. Once the camera module is connected to the NodeMCU board, need to write software to control camera and capture images or video..



Fig 5:- OV2460 Camera module wireless

It is possible to calculate the distance between the sonar sensor and the object.

Flat blade:

The flat blade in a smart lawn mower is typically part of the cutting mechanism that is responsible for cutting the grass. It is usually a metal blade that spins rapidly, driven by an electric motor. The flat blade is designed to cut the grass cleanly and evenly, without damaging the blades or roots of the grass. The smart lawn mower use sensors to detect obstacles .



Fig 6:- A flat blade to cut grass.

Two Bike motors:

The bike motors can certainly be used in a fully automated grass cutter, as they can provide the necessary power to drive the cutting blades and move the machine across the lawn.

The motor would need to be adequately powerful to handle the demands of cutting through grass, and it would need to be coupled with a suitable power source such as a battery. The motor controlled by a system that could accurately and reliably control the speed and direction of the cutting blades, as well as the movement of the machine .



Fig 7:- BLDC bike motor

2.6 Smart Grass Cutter With Lawn Coverage.

Controlling the movement of a lawn mower using Arduino and infrared cameras can be a fun and challenging project. Here's a basic overview of how it can be done.

Install infrared cameras: Install infrared cameras in front and back of the lawn mower to detect any obstacles in the way.

Implement obstacle detection: Using the infrared cameras, you can detect any obstacles in the path of the lawn mower. When an obstacle is detected, the NodeMCU can be programmed to stop the lawn mower, reverse it, or change the direction of the lawn mower to avoid the obstacle.

Control the motors: The NodeMCU is used to instruct the motors of the lawn mower. By using a motor driver, the NodeMCU can control the speed and direction of the motors to move the lawn mower in different directions[15]

Test and refine: Once it is programmed the NodeMCU and set up the infrared cameras, you can test the system by running the lawn mower in a controlled environment. Refine the system by tweaking the programming and adjusting the placement of the infrared cameras as needed.

Every equipment is made with the purpose to reduce greenhouse gas emissions, one of the main contributors to global warming. [16-17] As there is no fuel cost, this lawn mower is successfully meet the challenges of environmentally friendly production. For usage on lawns at homes and businesses where tractor-driven mowers couldn't be used, a lawnmower has been designed. The machine's capacity is sufficient for the job.

2.7.8 APPLICATION BASED ROBOTIC GRASS CUTTER USING IOT

Obstacles are avoided and the lawn mower is gully automated . It can also cut grass completely automatically without any assistance from a person. In this arrangement, 12V batteries are used to boost the lawn mover motors for movement.

The switching system consist of two selectors which is bldc e- bike motor 1 and bldc e-bike motor 2. Selectors are electrically connected to the battery system and function is charge and discharge the battery level. And it is connected between the two 12V batteries the charger module and the load system. Between charger and two 12V battery pack selector 1 is inserted. It consists of DC to DC converter which is controlled by the node mcu micro-controller signal applied to its terminals and supplies each battery according to a programmed algorithm. [18- 21]

2.9 Design of IoT-enabled powered grasscutter robot with remote monitoring and obstacle avoidance

By using the additional help of Blynk app ,a person can easily monitored the lawn mover as per the needed requirements. Blynk is an app that allows you to remote



Fig 8:- lawn mover control by blynk [22]

To control electronic devices such as lights, thermostats, and even grass cutters. However, in order to control a grass cutter with Blynk, you would need to have a grass cutter that is equipped with smart technology, such as a Wi-Fi connect control automatically.

Once you have a smart grass cutter, you can connect it to the Blynk app and control it from anywhere with an internet connection. [23] This can be particularly useful if you need to mow your lawn while you're away from home or if you want to schedule regular mowing sessions at specific times.

In addition to remote control, some smart grass cutters also come with features such as automatic mowing and obstacle detection. With the Blynk app, you can customize these features to fit your specific lawn care needs.

It's crucial to remember that using a smart grass cutter with the Blynk app necessitates a certain degree of technical knowledge and proficiency. For the Grasscutter system, which is managed through an Android mobile smartphone using the Blynk application programme, it may be preferable to engage a professional to help you if you're not confident setting up and installing smart devices. [24-25]

2.10 Implementation of Automatic lawn mover

When creating an automatic lawn mower, the following factors should be taken into account:

Navigation: The lawnmower must be able to steer clear of impediments and stick to a predetermined course. A control algorithm and sensors can be used to achieve this.

Safety: If the lawnmower tips over or runs into an obstruction, the cutting blade needs to be protected and made to stop very away. [26]

Power management: The lawnmower needs to be built so that it can run continuously on a single charge. This might necessitate the use of powerful motors and lots of batteries.

Durability: Because the lawn mower will be outdoors, it needs to be able to tolerate weather conditions including rain and sunlight.

User Interface: The lawn mower may have a user interface that enables the user to modify the mowing schedule, set the cutting height, and check on the mower's status. There are various processes involved in creating and implementing an automatic lawn mower. Here is a general description of what happens:[\[27\]](#)

Determine the Requirements: You must comprehend the lawn mower's specifications before you can start the design process. Included in this are the size of the lawn, the terrain's features, any barriers that are present, and the preferred cutting height.

Create the Mechanical Design: The mechanical design can be created once the requirements are understood. In order to do this, the right motor, wheels, cutting blade, and other parts must be chosen. A chassis should be incorporated into the design to house the components.

Design the Control System: The control system is in charge of steering the lawn mower and managing the cutting blade. In order to do this, a microcontroller, sensors, and motors can all be used together.[\[28-30\]](#)

RESULT AND DISCUSSIONS:

The design and making of this grass cutter can help the users for the easy availability and usage of a grass cutter with improved mechanism and control capacities which is reasonable for use in cutting different yards by every category of people and also further development of this can be led to upgradation of further versions and can be much more reliable and efficient in cost, design, power output, easy usage and many other aspects.

They arrive in various shapes and sizes, and each model might require various techniques for legitimate use and upkeep. To guarantee that clients have the essential data to work their grass cutters securely and successfully, makers frequently give a scope of writing connected with their items self-loader grass cutters is the client manual. This record gives bit by bit directions to gathering, working, and keeping up with the machine. It might likewise incorporate wellbeing admonitions and investigating counsel. Client manuals are normally given in a few dialects, to take special care of a worldwide market.

This incorporates handouts and notices intended to exhibit the elements and advantages of various models. This data is fundamental for fix specialists who need to recognize and arrange new parts for harmed machines. Specialized writing may likewise incorporate directions for performing routine support undertakings, like replacing the oil or honing the cutting edges.

CONCLUSION:-

The smart grass cutter designed with NodeMCU, e-bike motors, two 12V Amaron batteries, and ideal aluminum low weight frames, sprockets, and bearings is an excellent example of innovation and efficiency in lawn maintenance. The combination of these advanced technologies ensures that the grass cutter is easy to operate and produces a smooth and powerful cutting experience. The use of lightweight frames, sprockets, and bearings also contributes to the overall durability and maneuverability of the machine, making it an excellent choice for homeowners and professionals alike. With the added benefit of remote control through NodeMCU, users can enjoy maximum convenience and flexibility when using this smart grass cutter. In summary, this cutting-edge lawn maintenance solution is a testament to the power of technology to revolutionize traditional tasks and simplify our lives.

References:-

- [1]Mudda, M., VishwaTeja, S. K., & Kumar, P. (2018). Automatic grass cutter. *International Journal for Research in Applied Science and Engineering Technology*, 6(4), 1148-1151
- [2]A. Deo, A. Kumar, A. Shrivastava, A. Tiwari, N. Sharma, "Fully Automated Grass Cutter", *IJSRD*, Vol 5, Issue 01, 2017
- [3]N. Nagarajan, N. S. Sivakumar and R. Saravanan, "Design and Fabrication of Lawn Mower", *Asian Journal of Applied Science and Technology*, Vol 1, Issue 4, Pg 50-54, May 2017
- [4]Fully Automated Solar Grass Cutter, Tushar Baingane,,Sweta Nagrale, Suraksha Gumgaonkar, Shaila Ramteke, Girish Langade, Prof.V.M.Dhumal, Vol-4 Issue-2 2018 *IJARIE-ISSN(O)-2395-4396*
- [5]Fully Automated Grass Cutter, Akshay Hariya, Anil Kaddacha, Dhaval Dethaliya, Prof. Yashit D. Tita, *International Journal of Science and Technology* Volume 3, Issue 09, March 2017
- [6]Design and Modelling a Prototype of a Robotic Lawn Mower, Taj Mohammad Baloch and Timothy Thien Ching Kae
- [7]Dey, M., Sharma, A., Jha, A., Dhir, T., & Sharma, M. *SHREWD AUTOMATED RIDING MOWER WITH LAWN COVERAGE*.
- [8]Begum, N. *ENVIRONMENTAL BIOLOGY AND TECHNOLOGY*. Lulu. com.
- [9]Tushar Baingane¹, Sweta Nagrale², Suraksha Gumgaonkar³, Girish Langade⁴, Shaila Ramteke⁵ Prof.V.M.Dhumal⁶, "Review on Fully Automated Solar Grass Cutter", *International Research Journal of Engineering and Technology (IRJET)* Volume 5, Issue 2, Feb 2018
- [10]Bidgar Pravin Dilip¹, Nikhil Babu Pagar², Vickey S. Ugale³, Sandip Wani⁴, Prof. Sharmila M.5, "Design and Implementation of Automatic Grass Cutter", *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering* Volume 6, Issue 4, April 2017.

- [11]Kumar, S., Sharma, A., Sharma, R., & Kesarwani, S. (2018). A review paper on grass cutter device using bluetooth. J. Electron. Electromag. Technol, 1, 01-03.
- [12]"Smart Solar Grass Cutter Robot for Grass Trimming" by Ashish kumarchaudhari, Yuvraj sahu, Pramod kumarsahu, Subhash Chandra verma.
- [13] "Design and Implementation of Automatic Lawn Cutter" by Pratik Patil, Ashwini Bhosale, Prof. Sheetal Jagtap.
- [14] Bravo, R., "Tired From Mowing the Lawn", Journal of Pediatric Health Care, 24: 2010, 123–126.
- [15]Ambekar, M. Y. D., & Ghate, A. U. (2017). Solar based grass cutter. Int. J. Electr.Electron. Eng, 9(1), 694-698.]
- [16]US RE 8560, Passmore, Everett G., "Improvement in Lawn-Mowers", published 23 February 1869
- [17] 1869, issued 28 January 1879; see pg 1, col 2. For a copy, see Google Patents copy. This source indicates the patent number as "6,080". According to "British patent numbers 1617 -1852 (old series)", the patent number would have been assigned sometime after 1852 and taken the form of "6080/1830".
- [18] [Ernest L. Hall. A Survey of Robot Lawn Mowers, Available from: Ernest L. Hall Retrieved on: 06 October 2015
- [19] Technical Solutions, J. Hammond and R. Rafaels, DzBuild the Lawn Ranger,dzRadio Electronics, June 1990, pp. 31-49.
- [20] Robert Zondlo, U.S. Patent 5,461,292, Remote controlled guidance system for working vehicle ,October 24, 1995. Andre Colens, U.S. Patent 5,444,965, Continuous and autonomous mowing system , August 29, 1995.
- [21]Amrutesh, P., Sagar, B., & Venu, B. (2014). Solar grass cutter with linear blades by using scotch yoke mechanism. International Journal of Engineering Research and Applications, 3(9), 10-21.
- [22]Hicks II, R. W., & Hall, E. L. (2000, October). Survey of robot lawn mowers. In Intelligent Robots and Computer Vision XIX: Algorithms, Techniques, and Active Vision (Vol. 4197, pp. 262-269). SPIE.
- [23]Bhosale Swapnil, Khadke Sagar, DzSolar powered automatic grass cutterdz, ISSN: 0974-0056,volume no:04 issue:05,may 2017,International research journal of engineering and technology.
- [24]Ms.Yogita D. Ambekar, Mr. Abhishek U. Ghate, DzSolar based grass cutterdz, ISBN:978-93-86171-31-3, 26 Feb 2017, International conference on recent trends in engineering, science, Humanities and management.
- [25]Colens, A. (1995). U.S. Patent No. 5,444,965. Washington, DC: U.S. Patent and Trademark Office.
- [26]Patil, P. S. M., Prajakta, B., Snehal, K., & Dhanashri, P. (2018). Smart solar grass cutter with lawn coverage. International research journal of engineering and technology, 5(3), 3476-3479.
- [27]Skibniewski, M., & Hendrickson, C. (1990). Automation and robotics for road construction and maintenance. Journal of transportation engineering, 116(3), 261-271.
- [28]Swapnil, B., & Sagar, K. (2017). Solar powered automatic grass cutter. International Research Journal of Engineering and Technology, 4(05).
- [29]Ambekar, M. Y. D., & Ghate, A. U. (2017). Solar based grass cutter. Int. J. Electr. Electron. Eng, 9(1), 694-698.
- [30]Asha, N., Monica, J. S., Saraswathi, R., Rahul, R., & Ravikiran, R. (2017). Smart Grass Cutter. Perspectives in Communication, Embedded-systems and Signal-processing-PiCES, 1(6), 97-99.