International Journal of Recent Trends in Engineering & Research
ISSN(ONLINE) : 2455-1457
IMPACT FACTOR : 3.344

Design and Implementation of Autonomous Lawn Mower

Vaikundaselvan.B[1] ,Ramkumar.M[2], Ranjith.P[3],Pranav.K[3], Ragavender.T[3], Hariharan.S[3]
[1]Associate Professor and head,[2]Associate professor,[3]Student
Department of Electrical and Electronics Engineering,Kathir college of Engineering,Coimbatore

Abstract— The present technology commonly used for trimming the grass is by using the manually handle device. In this paper we have automated the machine for trimming the grass. The device consists of linear blade which is operated with the help of the motor the power supply for the motor is by using battery. The battery can be charge by using power supply and solar panel. In case of any obstacles in the path it is sensed by using ultrasonic sensor. If there is any variation then the device using free direction sensor and find the new path to travel. The above feature is enabled so that the damage to the hardware of the device is avoided. In future the automation of the device will play a vital role in world wide. This project is an autonomous lawn mower that will allow the user to the ability to cut their grass with minimal effort. Unlike other robotic lawn mowers on the market, this design requires no perimeter wires to maintain the robot within the lawn. Through an array of sensors, this robot will not only stay on the lawn, it will avoid and detect objects and humans. This design is still in the prototype stage due to financial and time constraints. Documentation includes all major design aspects.
Keywords—Arduino UNO, Ultrasonic sensor, H-Bridge motor,USB

I. INTRODUCTION

Mowing the lawn with a standard motor powered lawn mower is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, or disabled people. Motor powered push lawn mowers and riding lawn mowers create noise pollution due to the loud engine, and local air pollution due to the combustion in the engine. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Even though electric lawn mowers are environmentally friendly, they too can be an inconvenience. Along with motor powered lawn mowers, electric lawn mowers are also hazardous and cannot be easily used by all. Also, if the electric lawn mower is corded, mowing could prove to be problematic and dangerous. The self-propelling electric remote control lawn mower is a lawn mower that has remote control capability. This prototype is robotic user friendly, cost efficient, safe to use, efficient to use, and environmentally friendly. It can save significantly on labor costs.

Along with the various ages of users, this lawn mower can also be used people who have disabilities and are unable to use a regular push, or riding lawn mower. The prototype will also be automatic and will run on a charged battery with no cords to interfere with operation. This cordless electric lawn mower includes remote control capability which is less expensive than a robotic lawn mower with sensor capability. This robot lawn mower design is safe to use. With its remote control capability the lawn mower stays within the boundaries of the lawn because the user is able to have fun control over the lawn mower with the controller. This prototype is also environmentally friendly. There is no need for gas, oil, and engine to use this device because it is electric powered. Nowadays, lawn mowers are useful pieces of machinery that employ a revolving blade to cut a lawn at a smooth, even length. Since 1830, there have been various lawn mower designs that have been created. These designs include push lawn mowers, which are suitable for smaller lawns, and the ride-on mowers, which are capable to cut grass in larger lawns

The objective of the self-propelling electric remote control lawn mower is to extend the design of currently used lawn mowers, and to improve the capabilities of standard robotic lawn mowers as well as assuring cost efficiency. This self-propelling lawn mower design is comprised of remote control and autonomous capability that is user friendly so most consumers will be able to use this device. It is safe to use, as well as efficient because it electric powered and cordless. With these objectives mentioned, the self-propelling electric robotic lawn mower is environmentally friendly.

II. EXISTING SYSTEM

The portable Electric Grass cutter machine with solar power is used to fulfill the objectives of the proposed idea we need to understand the basic elements of few electronics like LM358 comparator, relay, solar panel, charging circuit, rechargeable battery, temperature sensor, geared DC motor, cutting blades etc.Working principle of the grass cutter is providing a high speed rotation to the blade, which helps to cut the grass. The blade will get kinetic energy while increasing the rpm. The cutting edges are very smooth and accurate. Also Electric Grass Cutting Machines are much easier to be used in garden, lawn and grass fields.

In order to enhance the beauty of home-lawns and gardens, Grass cutting machines are the best available option in the industry. With the help of a lawn mower which is a machine with revolving blades to help us cutting lawns at even length, people can easily maintain and beautify their lawns and gardens without any hassle.This system also has the two way charging unit. The battery gets charged through solar panel as well as the power supply. In the presented idea for grass cutter model we used Johnson DC motor interfaced with blades for cutting grass when operated. A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The input of a DC motor is current/voltage and its output is torque.

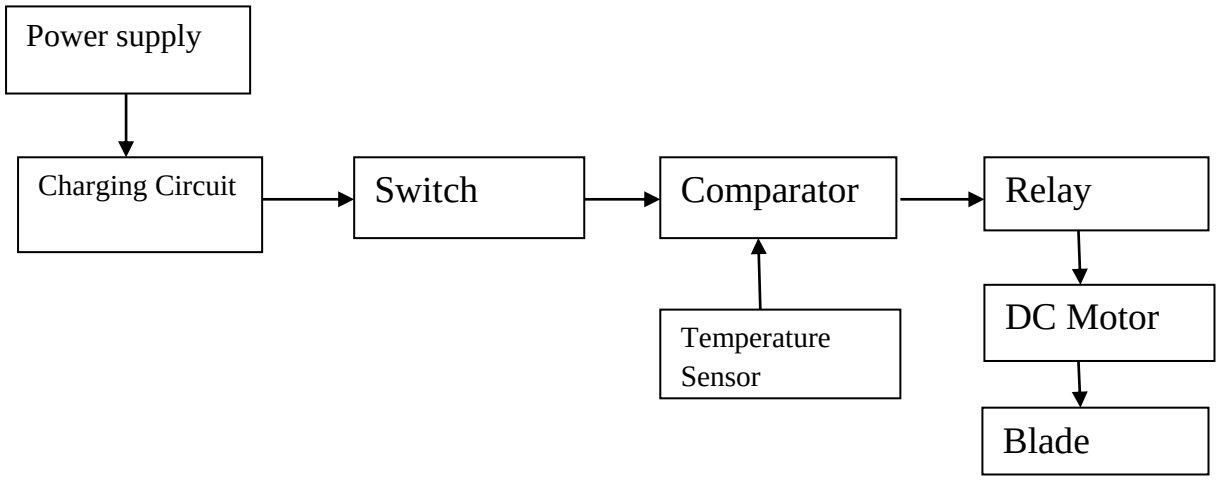


Figure 1 Block Diagram of Existing System

III. PROPOSED SYSTEM

The prototype will also be automatic and will run on a charged battery with no cords to interfere with operation. This cordless electric lawn mower includes remote control capability which is less expensive than a robotic lawn mower with sensor capability. This robot lawn mower design is safe to use. With its remote control capability the lawn mower stays within the boundaries of the lawn because the user is able to have fun control over the lawn mower with the controller. This prototype is also environmentally friendly. There is no need for gas, oil, and engine to use this device because it is electric powered. Nowadays, lawn mowers are useful pieces of machinery that employ a revolving blade to cut a lawn at a smooth, even length. Since 1830, there have been various lawn

mower designs that have been created. These designs include push lawn mowers, which are suitable for smaller lawns, and the ride-on mowers, which are capable to cut grass in larger lawns.The objective of the self-propelling electric remote control lawn mower is to extend the design of currently used lawn mowers, and to improve the capabilities of standard robotic lawn mowers as well as assuring cost efficiency. This self-propelling lawn mower design is comprised of remote control and autonomous capability that is user friendly so most consumers will be able to use this device. It is safe to use, as well as efficient because it electric powered and cordless. With these objectives mentioned, the self-propelling electric robotic lawn mower is environmentally friendly.The process is fully control by the remote control system. The control environment is designed to perform the movement of the motor.The up and down operation also controlled using the keypad environment.

BLOCK DIAGRAM

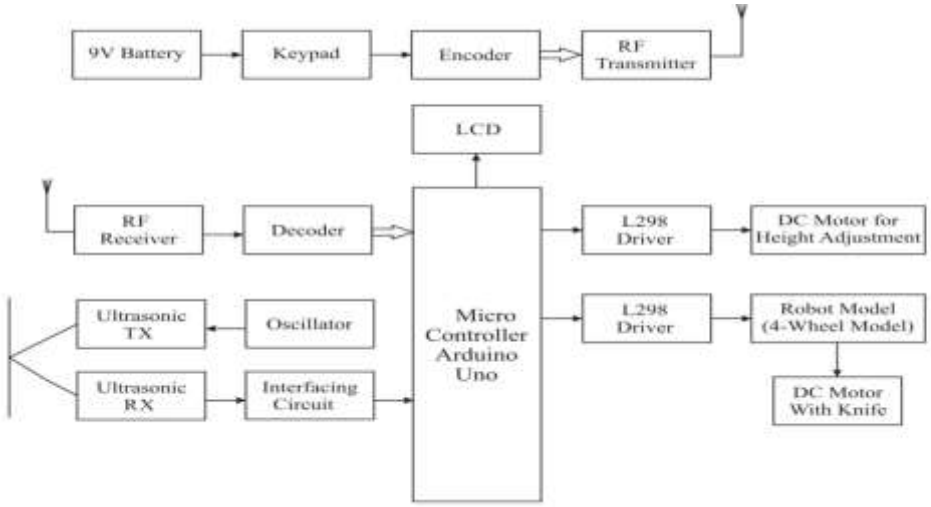


Figure 2 Block Diagram of Proposed System

SCHEMATIC DIAGRAM

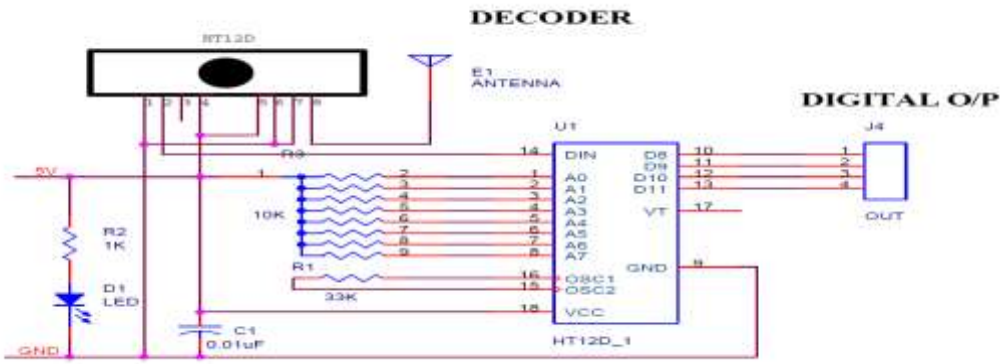


Figure 3 Receiver with decoder

This circuit utilizes the RF module (Tx/Rx) for making a wireless remote, which could be used to drive an output from a distant place. RF module, as the name suggests, uses radio frequency to send signals. These signals are transmitted at a particular frequency and a baud rate. A receiver can receive these signals only if it is configured for that frequency. A four channel encoder/decoder pair has also been used in this system. The input signals, at the transmitter side, are taken through four switches while the outputs are monitored on a set of four LEDs corresponding to each input

switch. The circuit can be used for designing Remote Appliance Control system. The outputs from the receiver can drive corresponding relays connected to any household appliance.
The signal is being decode and then the decoded signal is send to the controller and the motor control circuit.

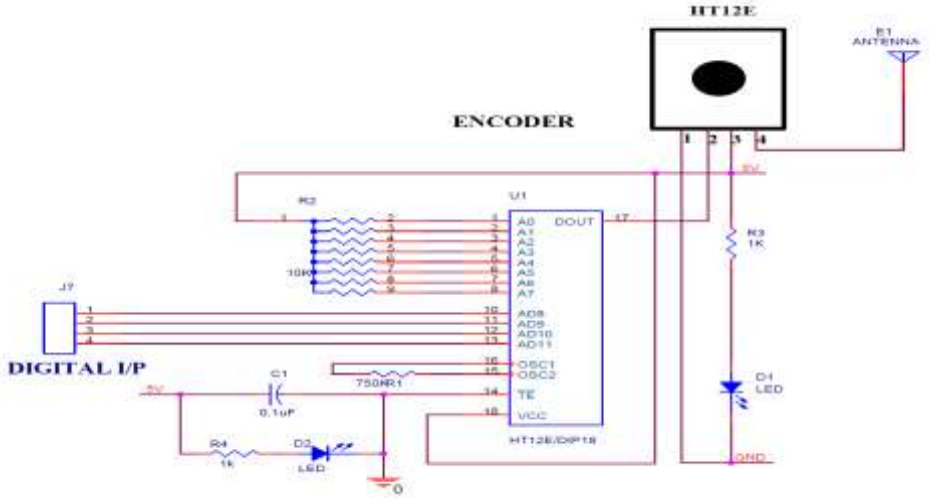
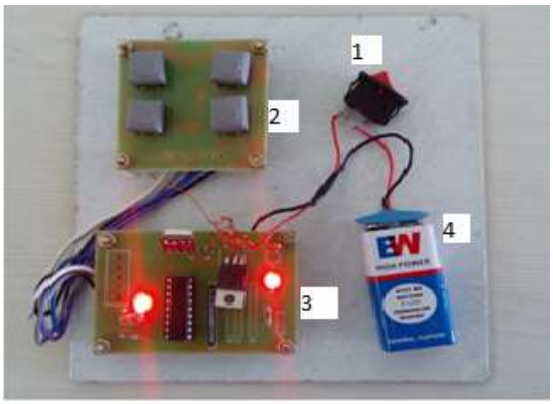


Figure 4 Transmitter with Encoder

The system allows one way communication between two nodes, namely, transmission and reception. The RF module has been used in conjunction with a set of four channel encoder/decoder ICs. Here HT12E & HT12D have been used as encoder and decoder respectively. The encoder converts the parallel inputs (from the remote switches) into serial set of signals. These signals are serially transferred through RF to the reception point. The decoder is used after the RF receiver to decode the serial format and retrieve the original signals as outputs. These outputs can be observed on corresponding LEDs

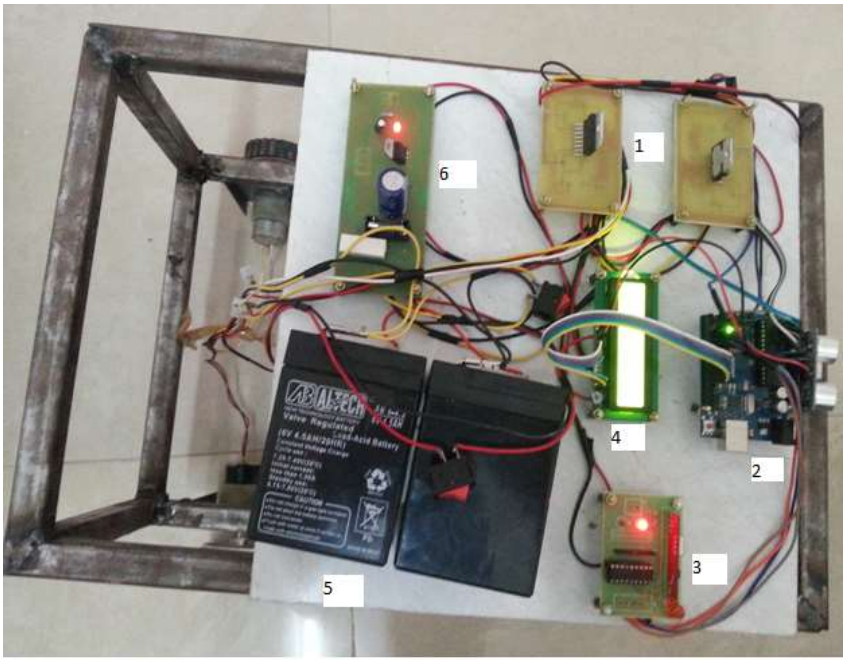
Encoder IC (HT12E) receives parallel data in the form of address bits and control bits. The control signals from remote switches along with 8 address bits constitute a set of 12 parallel signals. The encoder HT12E encodes these parallel signals into serial bits. Transmission is enabled by providing ground to pin14 which is active low. The control signals are given at pins 10-13 of HT12E. The serial data is fed to the RF transmitter through pin17 of HT12E.

HARDWARE RESULT



Keyboard control circuit

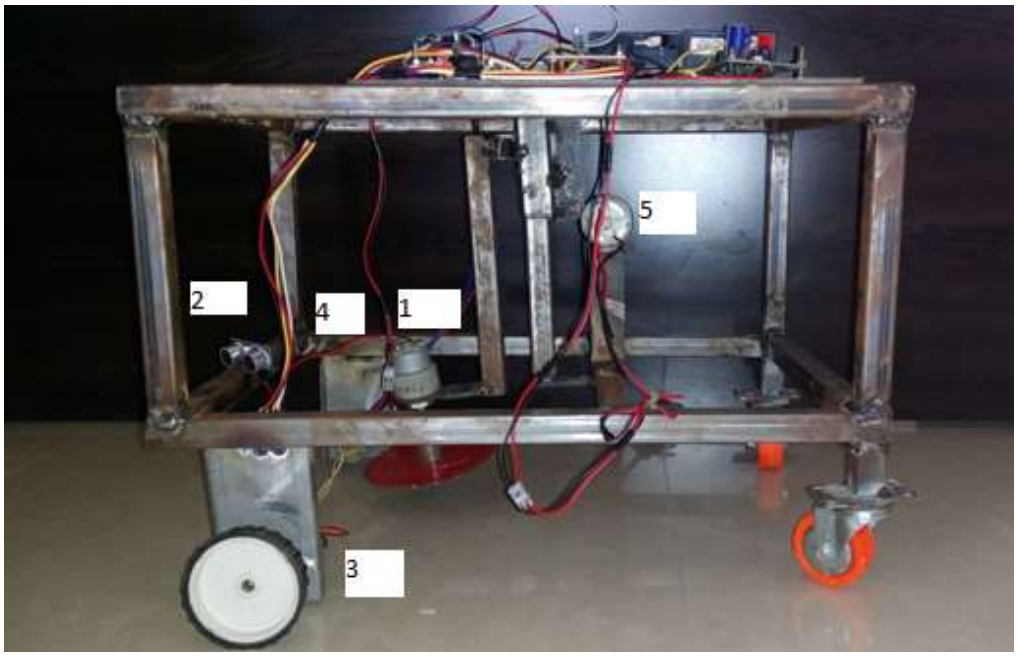
1. ON/OFF switch
2. Transmitter
2. Key Board
4. Battery



Robotic control Circuit Board

1. L298 motor driver
2. Arduino
3. Receiver
4. LCD Display
5. Battery
6. Filter

This module control the movement of the lawn mower depends on the signal from the sensor results.
The direction is control by the keyboard depends on the sensor signal.



Mechanical Model

1.DC Motor with Blade
2. Ultrasonic Sensor
3. Left Motor
4. Right Motor
5. Gear Motor

IV. CONCLUSION

The smart lawn mower design is achieved minimum working time, minimize the cost, minimum energy consumption, and mixed operation mode. The theory proposed in path planning has been verified with experiments. The adjustable blade system can improve the efficiency and also minimize the working time. In future a grass collection box can be mounted.

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