

AUTOMATED SOLAR OPERATED GRASS CUTTING MACHINE

**Anuradha Kadam¹, Vrushali Khadake², Snehal Nalawade³,
Karishma Mujawar⁴, Nilofar Mulla⁵**

*^{1,2,3,4,5}Electrical Engineering,
Nanasaheb Mahadik College of Engineering, Peth (India)*

ABSTRACT

Grass cutter is a device which is used to cut the grass at different places like artificial lawn, play grounds, small nurseries etc. Manually operated grass cutter creates pollution and noise and it requires more human efforts and time. To overcome this drawback we have to design the advanced Grass Cutter. It is automatic machine which can be operated on solar energy. The whole control is achieved by using microcontroller. In our project we also detect obstacle by using sensors.

Keywords: *Advanced Grass Cutting, Geared DC motor, Gyroscope, IR Sensor, Solar Energy.*

I.INTRODUCTION

The first grass cutter developed by Edwin Budding in 1830 in Thrupp. Now, a day's pollution is a major problem in the world. The conventional grass cutter produces air pollution. The working principle of grass cutter is to provide a high speed rotation to blade, which help to cut the grass. Also electric grass cutting machine are much easier in garden, lawn and grass fields in order to enhance the beauty of home lawns and gardens grass cutting machine are the best option available in market with the help of grass cutter machine with revolving blade to help us cutting lawns at even length people can easily maintain and beautify their lawns and gardens the proposed solar grass cutter consist of solar panel, gyroscope, microcontroller 89S52, battery, geared dc motor for wheels, IR sensor for obstacle detection, etc. the raw material used are wheels, wires, plywood etc.

II.METHODOLOGY

To design this project we have used microcontroller, solar panel, sensor, battery and gyroscope, also IR sensor to detect an obstacle which comes in front of the Robot. For controlling the machine or for giving appropriate direction gyroscope is used instead of remote control. Gyroscope is placed on hand and by tilting the hand we can control the directions. Battery can be charged by solar panel. Lead acid battery of 7.5 AH is used.

1. Components used

- 1.1. Solar Panel
- 1.2. Lead Acid Battery
- 1.3. Geared DC Motor
- 1.4. Steel Blades
- 1.5. Transmitter
- 1.6. Receiver

1.1. Solar Panel

Working:-

Solar cell is a P-N junction diode. When solar light falls on cell, it produces two types of particles, negatively charged and positively charged in the semiconductor. Negatively charged electrons gather around the N-type semiconductor while positively charged electrons gather around the P-type semiconductor. A number of solar cells are electrically connected to each other and mounted on a supporting structure or frame called as "Photovoltaic module". When load is connected to solar panel, electric current starts to flow.

Rating: 12 volts, 10 watt.

1.2. Lead-Acid Battery:

Battery is used for storage of energy. Here, lead acid battery is used due to following reasons:

1. Low cost
2. Long life
3. More Current capacity.

1.3. Geared DC Motor:

Geared motors are electric motors that utilize a type of gear system at the output side of the motor. This arrangement is called gear box. The combination of electric motor and gear box reduces design complexity and lowers the cost. Particularly, these motors are built for high torque and low speed applications. Here five motors are used, four motors for driving of wheel and one for blade.

1.4. Blades:

Blades are used for cutting the grass. They are usually made up of stainless steel. These blades are able to withstand high speed contact with variety of objects in addition to grass. The length of blade is 7 inches.

1.5. Transmitter:

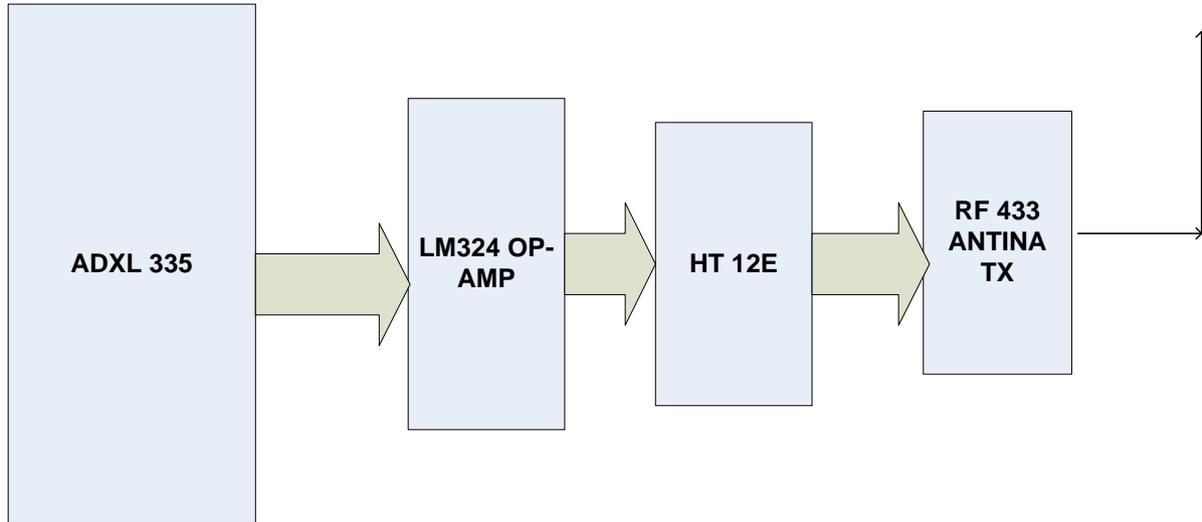


Fig 1.-: block diagram of transmitter

1.5.1. ADXL 335:

The ADXL 335 is a small low power complete three axis accelerometer with signal conditioned voltage output. It consists of three axes X, Y, Z respectively. It can be operated by tilting hand.

Advantages:-

1. Cost sensitive, low power, motion and tilt sensing application.
2. Mobile device
3. Gaming system
4. Image stabilization.

1.5.2. HT12E:

HT12E is an IC which is capable of converting 12 bit of parallel data input to serial output.

1.5.3. LM324:-

It is an instrumentational amplifier cod op-amp, it acts as comparator which compares two voltage levels and sends high voltage at the output.

1.6. Receiver:

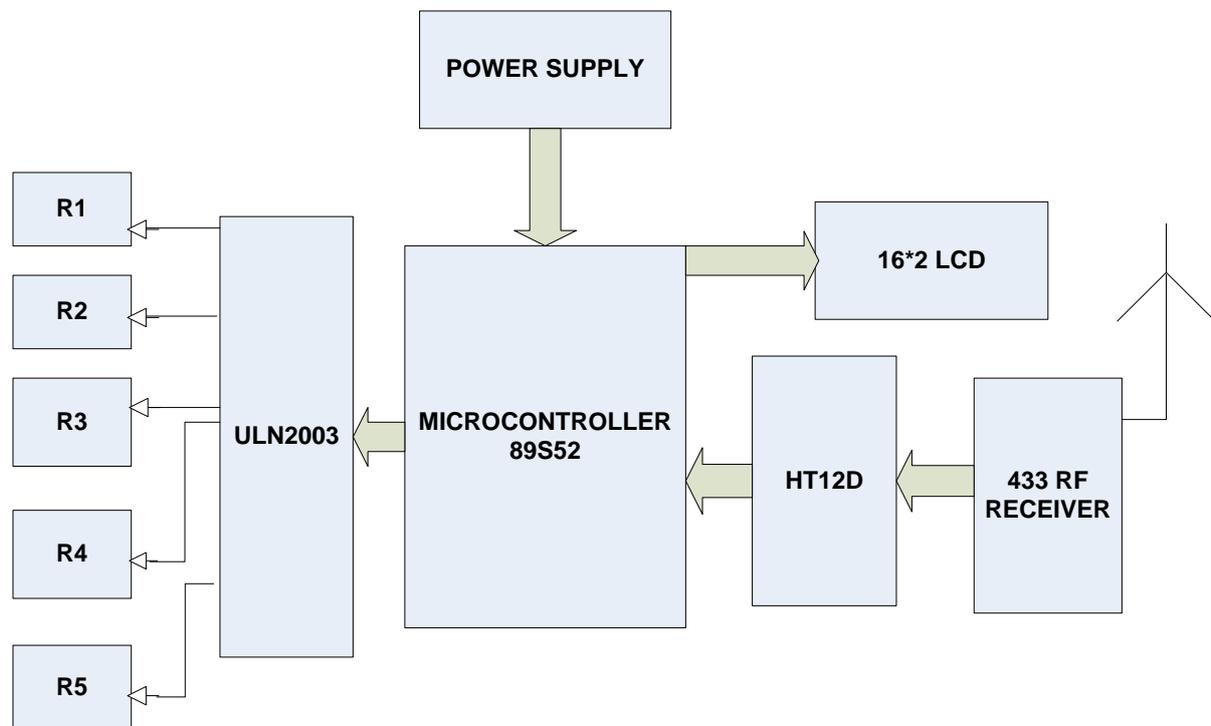


fig.2.-: block diagram of receiver

It consists of following components:

1. 89s52 Microcontroller:-

The 89S52 has four different ports, each one having 8 input output lines providing a total of 32 I/O lines. These ports can be used for output DATA and orders to other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have 'dual function' meaning that they can be used for two different functions. The first one is to perform input/output operations and the second one is used to implement special features of the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer to update the software. Each port has 8 pins, and will be treated from the software point of view as an 8 bit variable called 'register' each bit being connected to a different input/output pin.

2. HT12D Receiver:

HT12D is a decoder integrator circuit that belongs to series of decoders. This series of decoders are mainly used for remote control system applications like burglar alarm, car door controller, security system etc. It is mainly provided with interface RF and infra red circuits. HT12D is capable of decoding 12 bits, of which 8 are address bits and 4 are data bits. The data on 4 bit latch type output pins remain unchanged until new is received.

3. ULN2003:

The ULN2003 is known for its high current and high voltage capacity. The drivers can be paralleled for even higher current output. Even further, stacking one chip on top of another, both electrically and physically, has been done. Generally it can also be used for interfacing with a stepper motor, where the motor requires high ratings which cannot be provided by other interfacing devices.

III.BLOCK DIAGRAM

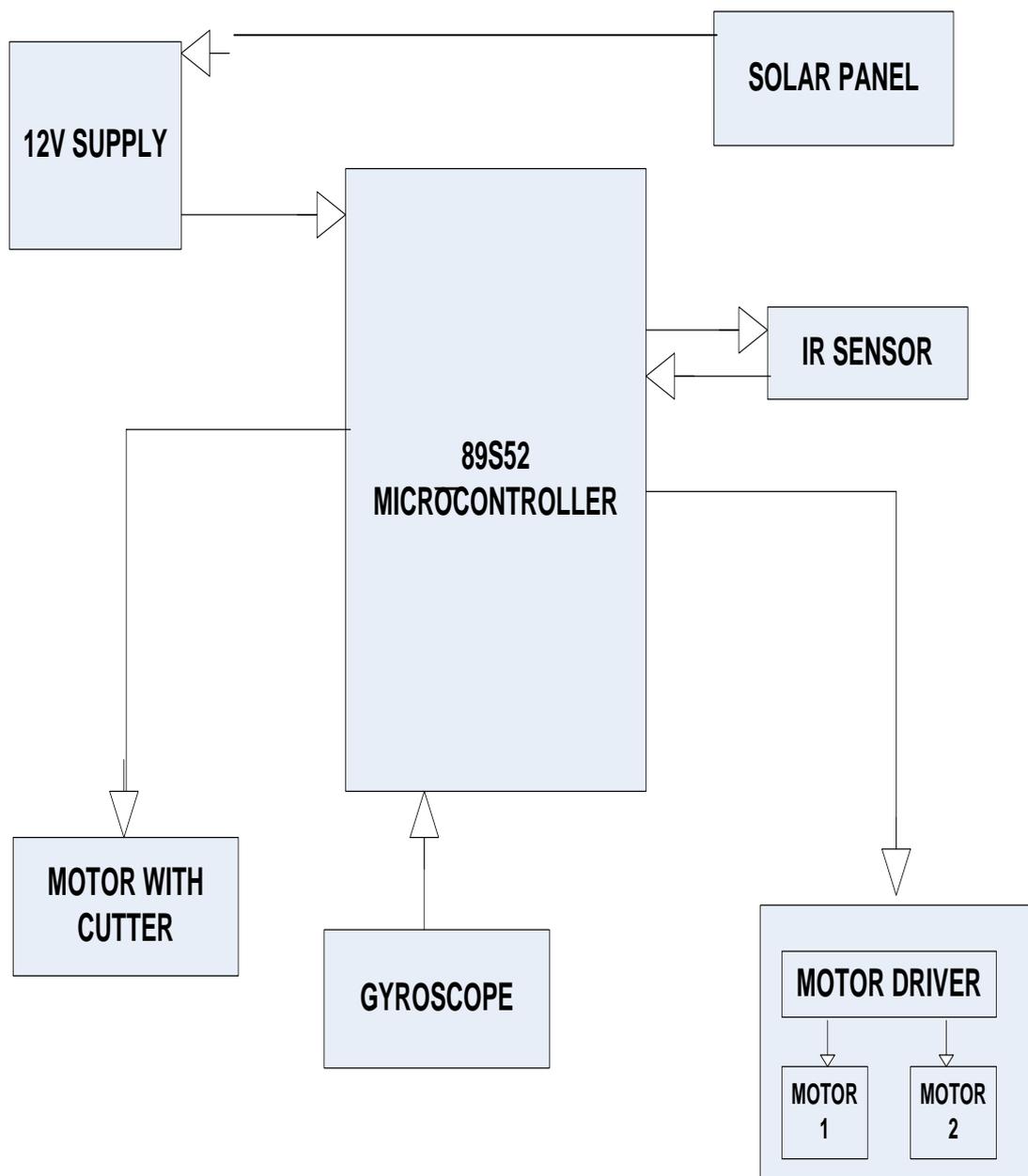
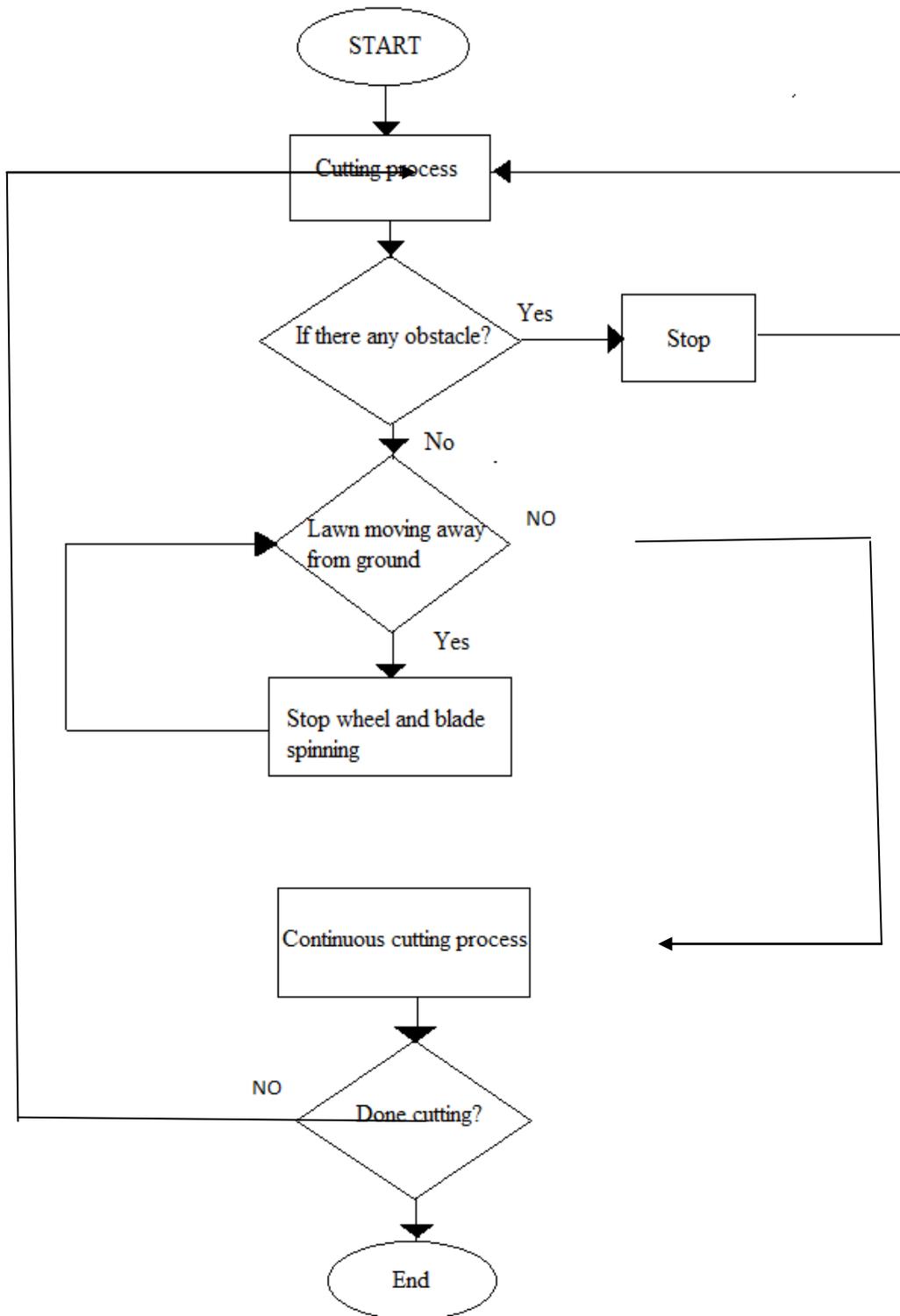


fig:3. block diagram of grass cutter

IV.WORKING

One of the components of this machine is a solar panel. This panel is mounted horizontally on chassis by support so it can easily receive solar radiation with high intensity from the sun. This solar panel converts solar energy into electrical energy. This electrical energy is stored in a battery. The transmitter kit contains 7805 voltage regulator which gives output of 5volt, but gyroscope is operate on 3.3volt. Therefore this 5volt DC supply is reduced to 3.3volt by using preset key. Gyroscope consist of 3-axis, X-out, Y-out, Z-out. X and Y are used for left and right direction. The signal from gyroscope is given to the LM324 cod op-amp which is act as comparator. This compares two voltage levels and sends high voltage to the output. The data from comparator is converted into 4-bit data by using HT12E. This 4-bit data is transmitted to receiver through RF transmitter antenna. This transmitted signal is received by the RF receiver. The 4-bit encoded data received from transmitter is decoded by HT12D decoder. The data from HT12D is given to microcontroller 89S52. The energy stored by battery is given to the LM7805,it has three terminals like output, common, input. 12volt dc supply from battery is given to input and common terminal and 5volt dc is taken from output and common. This 5volt dc is given to capacitor rated 10 microfarad to get ripple free output supply which is given to 89S52 microcontroller. It consists of 4 ports out of which 3 ports are used for controlling action. Relay is connected to port 0, the LCD is connected to port 1 and RF receiver is connected to port 2. The three external pull up resistors are connected to these ports as a standby resistor. The crystal oscillator is connected to pin XTAL1 and XTAL2 to create delay and generate clock frequency of 12.5MHz. Microcontroller usually cannot provide enough current to drive relays, it can usually provide maximum current 1-2mA per pin which is not enough to operate relay. Here, the relay driver ULN2003 is used to drive the relays. Relay is used to provide isolation between microcontroller circuits and high voltage operating loads. Microcontroller is only used to provide ON, OFF signal to relays. Here 5 relays are used one for blade motor and remaining four for wheels of motor. For obstacle detection IR sensor is used which is placed in front of the chassis. The IR transmitter sends IR radiation which is reflected on a surface and falls on the receiver. Due to the falling of light on the receiver, a potential difference is created across the ends. This is recognized by microcontroller. The grass is actually cut by the blades which are made up of stainless steel.

Algorithm:



V.CONCLUSION

Nowadays, lot of energy is wasted for grass cutting in different areas of the world and also takes lots of human effort for the work. We have made the solar powered automated robotic grass cutter system which has been resulted in cutting grass in smart and efficient way with lesser human effort. We are trying to get better results with this design.

VI. FUTURE SCOPE

In this design, more sensors can be incorporated for the accurate precision and improved automation. If panel is used of high watt, then machine can be used during night time for the garden lighting or room lighting, because we can accumulate more power and at night time however you keep it apart, so the power in the battery can be used for this intention. Grass cutting can be made more proficiently used after modifying for the small rice harvesting. Programming can be enhanced to make the device performed for different operations. We can install the grass collector to collect the grass, instead of leaving behind it.

REFERENCES

- [1] "Smart solar grass cutter robot for grass trimming", by Ashish kumar chaudhari, Yuvraj Sahu, Pramod Kumar Sahu.
- [2] "Design and implementation of automatic lawn cutter" by prof. Sheetal Jagtap.
- [3] "Modification of solar grass cutting machine "by Praful P. Ulhe, Manish D. Inwate and Fried D. Wankhede Krushnkumar S. Dhakte. *IJRST*
- [4] "Tired from Mowing the Lawns", Bravo R, *Journal of Pediatric Health care*, 24-2010, 123-126.
- [5] "Self-propelled Self-guiding Lawn Mower", Pansire, D.G. *U.S. Patent 4, 1980, 180,964*