

Automated Lawn Mower

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Abstract— By this fact the project was constructed and design to help in the development and maintenance of institution, community and the society at large in the area of grass cutting in our environment and the improvement in our food production and also the reduction of manpower. A normal grass cutter moving with IC engine will run based on the energy from petrol. The major drawbacks of this technology are high running cost, creates noise pollution and air pollution. Also, an IC engine requires periodic maintenance such as changing the engine oil, mechanical maintenance. Electric grass cutter is an innovative technology of cutting grass without any pollution, which is environmentally friendly also eliminating the use of perimeter wires. Nowadays, the labor charge is increasing day by day. This technology can help the people who are living in rural areas. This project is mainly proposal for reduce the manpower and Cost. The system control is done by the Arduino circuit. The grass cutter and vehicle motors are interfaced to an Arduino circuit that controls the working of all the motor. One of the important aspects of the mower is the Bluetooth module which helps to control the mower using a Mobile Gadget or a remote.

Keywords— Electric grass cutter, pollution, manpower, Cost

I. INTRODUCTION

In the past, cutting of grasses in the schools, sports track, or field, industries hotels, pubic center, etc. was done by cutlass this method of manual cutting is time consuming a s it is human effort that is needed for cutting, there was also inaccuracy in cutting level using the manual cutting system. Apart from all these old methods of cutting there is also risk of accident. The problems of the manual were meant to be overcome with the aid of this project (the construction of an automated lawn mower) which is used for cutting of grasses to equal height or level for speedy cutting from a stationary place. This project lawn mower is also the accident free as well, it reduced labor and also reduced number personnel that are needed in a particular operation, it also reduced man power, and great portion of land can easily be cut with lawn mower. Again, to encourage beauty in our environment this project was embarked on to help in keeping our environment clean because most laborers are finding it difficult in handily tool for gasses cutting. It is also used for cutting sports field, like football ground as well as crowns in hotel and business premises so this project

reduces human effort and should be encouraged in school, hotel, business area, etc.

II. METHODOLGY

A. Lawn mower Frame selection

The Project consists of a wooden plank of thickness 1.2 cm which is the base of the lawn mower. The wooden material has been selected for its ease of availability and the cost. The main factors of choosing wood as base plate are as follows

- Readily available and less capital cost
- Weight consideration
- Less weight when compared to other metal base plate.

B. Blade Selection

1. Knife Blades

These types of blades have a sharpened knife edge to the front edge of the blade and cut by slicing through vegetation. It is by far the most common type of metal blade and often comes standard, with brush cutters that come with a metal blade. There is almost infinite number of shapes of knife blades, but whatthey all have in common is, they are generally lasered or stamped from thin sheets of steel.



Fig 1 Knife blades

2. Smasher Blades

These types of blades have no sharp edges and generally rely on their thin thickness and weight of the pivoting blade or chain to smash through vegetation. These are generally pivoting flail type blades, linked metal blades and a range of different types of chain.



Fig 2 Smasher blades

3. Chisel Blades

These types of blades have a sharpened tooth around the perimeter of the blade and cut by chiseling through or shaving their way through vegetation. All of these blades are circular with varying number of teeth around the perimeter. These teeth can be part of the blade and have a bent offset for blade clearance, or have chain saw type blades, either riveted to the disc, or an actual chain saw blade riveted between two discs.



Fig 3 chisel blades

C.Arduino

Arduino is an open-source platform that is used for building electronic projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on computer which is used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.



Fig 4 Arduino platform

The Arduino hardware and software were designed for artists, designers, hobbyists, hackers, newbies, and anyone interested in creating interactive objects or environments. Arduino can interact with buttons, LEDs, motors, speakers, GPS units, cameras, the internet, and even your smart-phone or you're TV. This flexibility combined with the fact that the Arduino software is free, the hardware boards are pretty cheap, and both the software and hardware are easy to learn has led to a large community of users who have contributed code and released instructions for a huge variety of Arduino-based projects.



Fig 5 Variety of Arduino-based projects

III. WORKING PRINCIPLE

- First the dc motors are connected to inputs of driver modules and then to the corresponding inputs of Arduino Uno.
- The supply and ground terminals from the Bluetooth chip are connected to that of the Arduino board through jumper wires.
- The power terminals are connected to the 12V DC battery because 5V supply obtained through direct connection is insufficient to run the motor. Thus a 12V battery is provided.
- Now upload the program code to the Arduino through the system
- Then connect the RX (receiver) and TX (transmitter) of the Bluetooth chip to the TX and RX of the Arduino Uno.
- Connect the Bluetooth by using a smart phone.
- Control the motion of the motor through the commands available in the required application.

IV. CALCULATIONS

A. Location Of Centre Of Gravity Of Automated Lawn Mower

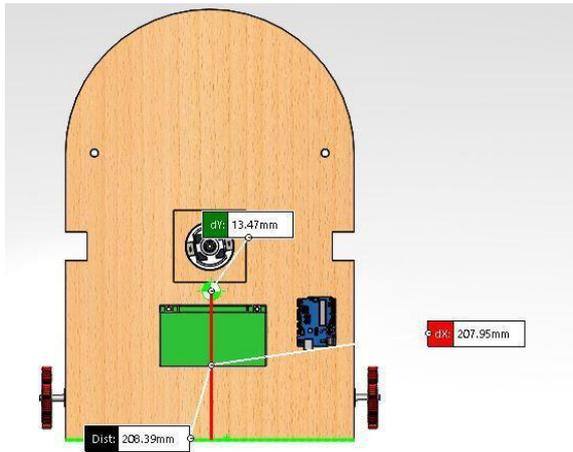


Fig 6 CG Location

B. Torque Calculations

For 1000rpm

Voltage=12v, Current= 3A

Power= voltage * current

 $P=12*3= 36W$

Torque:

 $T=P*60/2\pi N$ $T=P*60/2\pi N = 36*60/2\pi*1000$ $T=0.3437N\cdot m$ $T=3.5\text{ kg}\cdot\text{cm}$

For 100rpm

 $T=P*60/2\pi N$ $T=36*60/2\pi*100$ $T= 3.437N\cdot m$ $T=35\text{kg}\cdot\text{cm}$

Maximum Load =15kgs, for ease of operation

C. Arduino Program

The Arduino programming is done using Arduino IDE software. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

Program Codes:

```
void setup() {
  pinMode(2,OUTPUT);
  pinMode(3,OUTPUT);
  pinMode(4,OUTPUT);
  pinMode(5,OUTPUT);
  pinMode(6,OUTPUT);
  pinMode(7,OUTPUT);
  pinMode(8,OUTPUT);//trig1
  pinMode(9,INPUT);//echo1
  pinMode(10,OUTPUT);
  pinMode(11,OUTPUT);
```

```
pinMode(12,OUTPUT);
pinMode(13,OUTPUT);
```

```
Serial.begin(9600);
}
void loop() {
  // put your main code here, to run repeated1 int
  duration1;
  int distance1; char Data;
  digitalWrite(8, LOW);
  delayMicroseconds(2);
  digitalWrite(8, HIGH);
  delayMicroseconds(10);
  digitalWrite(8, LOW); duration1 =
  pulseIn(9, HIGH); distance1=
  duration1*0.034/2;
  Serial.println(distance1);
  if(distance1<15)
  {
    digitalWrite(11, LOW);
  }
  if(distance1>15)
  {
    digitalWrite(11, HIGH);
  }
}
```

```
if (Serial.available(>)>0){
  Data=Serial.read();
  switch(Data)
```

```
{
  case 'f':
    digitalWrite(2, HIGH);
    digitalWrite(3, LOW);
    digitalWrite(4, HIGH);
    digitalWrite(5, LOW);
    digitalWrite(12,HIGH);
    digitalWrite(13,LOW);
    break;
```

```
case 'b':
  digitalWrite(2, LOW);
  digitalWrite(3, HIGH);
  digitalWrite(4, LOW);
  digitalWrite(5, HIGH);
  digitalWrite(12,HIGH);
  digitalWrite(13,LOW);
  break;
```

```
case 'l':
  digitalWrite(2, HIGH);
  digitalWrite(3, HIGH);
  digitalWrite(4, HIGH);
  digitalWrite(5, LOW);
  digitalWrite(12,HIGH);
  digitalWrite(13,LOW);
  break;
```

```
case 'r':
  digitalWrite(2, HIGH);
  digitalWrite(3, LOW);
  digitalWrite(4, LOW);
```

```
digitalWrite(5, LOW);
digitalWrite(12,HIGH);
digitalWrite(13,LOW);
break;
```

```
case 's':
digitalWrite(2, HIGH);
digitalWrite(3, HIGH);
digitalWrite(4, HIGH);
digitalWrite(5, HIGH);
digitalWrite(12,LOW);
digitalWrite(13,LOW);
break;
```

D.Automation

The automation coding is done in a rectangular pattern. The length and width of the field should be given as input. Then the length is converted into number of forward wheel rotation and the width is converted into number of turn (left or right). The mower is expected to maintain constant speed around the garden area; this speed should not be very fast as it should be able to accomplish its main purpose, which is of cutting grass. During motion it is important that the device is kept in a straight line (in the forward path) and able to turn at a 180 degrees angle at the extremity of the garden in order to continue with the same motion in the opposite direction and adjacent to the previous path taken.

Automation Codes

```
case 'A':
digitalWrite(2, HIGH);//forward
digitalWrite(3, LOW);
digitalWrite(4, HIGH);
digitalWrite(5, LOW);
digitalWrite(12,HIGH);
digitalWrite(13,LOW);
delay(5000);
digitalWrite(2, HIGH);//right
digitalWrite(3, LOW);
digitalWrite(4, LOW);
digitalWrite(5, LOW);
digitalWrite(12,HIGH);
digitalWrite(13,LOW);
delay(5000);
digitalWrite(2, HIGH);//forward
digitalWrite(3, LOW);
digitalWrite(4, HIGH);
digitalWrite(5, LOW);
digitalWrite(12,HIGH);
digitalWrite(13,LOW);
delay(5000);
digitalWrite(2, HIGH);//left
digitalWrite(3, HIGH);
digitalWrite(4, HIGH);
digitalWrite(5, LOW);
digitalWrite(12,HIGH);
digitalWrite(13,LOW);
delay(5000);
break;
}
}
```

V. RESULT AND CONCLUSION

The Automated Lawn Mower is an efficient device that can be used to mow the land by the operator controlling the mower from a stationary place using the Bluetooth that is paired to his mobile gadget. The device comprises of an Arduino and a Bluetooth module which helps the operation of the mower to be completely through mobile or laptop. The Arduino is coded accordingly to cut the grass by the rotation of the blades only when the device moves. And the blades stop rotating once the mower becomes stationary or comes to rest. This system eliminates the use any kind of fuel thus eradicating air and noise pollution. The main advantages of this Automated lawn mower is that it's movements can be operated and controlled through the Bluetooth, also a cost- efficient device as it can purchased below Rs.10,000 and it is a compactable device which can be easily carried along with them. Thus, it can be a boon to many people who can't afford Robotic Lawn Mowers, Conventional Lawn Mowers which requires high maintenance cost.

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