Chapter-1

INTRODUCTION

1.1   Background

The first lawn mower was contrivance in 1827 and patented in 1830 by Edwin Beard Budding, an engineer from Stroud, Gloucestershire, England. [1]

He got this idea after seeing a machine in a textile industry, they used a cutting cylinder (or bladed reel) mounted on a bench to trim cloth to make a smooth finish after weaving. Budding realized that a similar concept would enable the cutting of grass if the mechanism could be mounted in a wheeled frame to make the blades rotate close to the lawn's surface.

First lawn mower was all made of cast iron and featured a large rear roller with a cutting cylinder (reel) in the front. Cast iron gear wheels transmitted power from the rear roller to the cutting cylinder. These machines were remarkably similar to modern mowers. [1]

By 2000, robotic are most important things in the future, no matter if they are used to work in industry or at our homes, mimic some of the human capabilities, or used to access dangerous environments, launched to space, or simply used to play with. They are help to reduce human dependencies in performing a task and to reduce time for production while maintaining consistent quality of production outputs. Robotic devices are commonly used in manufacturing industries and for domestic use as well.

Modern houses normally garden with grass need to be maintained at a short height, is most user upset. Traditional lawn mowing is often a trouble, dangerous and time consuming in cutting the grass. A simple lawn mower is designed and installed in this project.

Automatic Lawn mower also can act as an aid to homeowners who can no longer perform physically demanding tasks, such as the elderly or disabled. On the residential side, many elderly and disabled enjoy lawn maintenance, but are no longer able to enjoy the satisfaction of maintaining their own lawn due to the physical demands of traditional lawn mowing equipment. These researches (automatic lawn mowers) are very elderly and disabled friendly with the simple. Automatic lawn mower also has the Perfect Balance Between Eco-friendly and Practicality. [1]

1.2 Objective:

In the course of design and installation of an Android control Lawn Mower System, the following criteria are set to fulfill its objectives:

- To create a program for android operation.
- To design and implement a torque motor speed Control using AC power System.
- To Use Gear Motor for movement.
- To control 2 gear motor for moving forward and backward using Bluetooth technology by Android smart phone.

Chapter-2

Literature Review

Kartik R. Khodke [2]: This paper summarizes and reviews technological development for making efficient and cost effective grass cutter. Our aim is to study the various developments in the grass cutter machines and their performance. Current technology commonly used for cutting the grass by the manually handled device From the survey we found that various types of grass cutter available in market which are run by means of solar, electric and internal combustion engine. Grass cutters are available in market having some limit to cut grass at some height. We are trying to make the new innovative concept mainly used in agricultural field. We are going to fabricate the grass cutting machine for the use of agricultural field, to cut the crops in the field as well as to cut the grass.

Manpreet Singh [3]:A review on solar, electric and gasoline powered grass cutting machine comprises of a panel of photovoltaic cells, an electric motor and a rechargeable battery pack has been studied. This review discusses about the designing, analysis and fabrication of lawn mowers that play a vital role in day-to-day life. Furthermore, paper elaborates different technical implementations related to lawn mowers such as variation in blade angles of grass cutting machine and cutting rate of grass, speed and turning radius of machine that lead to the more flexible working of lawn mowers. The renewable energy resources such as solar energy from solar panel can be used for charging the battery and used for driving the remote controlled machine. A review also includes the environmental issues of gasoline grass cutting systems that affect the environment and deteriorate the quality of the atmosphere. The research on direct current electric grass cutting machine leads to ascertain the advantages over the gasoline machine. Furthermore, electric and solar powered remote controlled lawn mowers are trying to take over the conventional gasoline and manual lawn mowers. Remote controlled mowers need complicated circuits that are also discussed in the paper. The results revealed that solar cells can produce 175 watts under the normal sun condition in case of solar powered lawn mower. Moreover, it was surveyed that approximately 50,000 U.S.

people were injured by lawn mower cutting blades that leads to the quest of novelty in the safe usage of machines and devices in household applications.

Dutta P.P[4] : This paper summarizes and reviews different technological developments for making efficient and cost effective lawn mowers. Such lawn mower may be powered by solar energy, conventional electric and internal combustion engine. For each type of energy source mentioned above, we discuss the mechanisms followed for lawn mower device, the design of the model and results obtained in various literatures. Sometimes two such energy sources may be used in combination, like solar powered robotic lawn mower.

Ashwani Dixit [5]: The design objective is to come up with a mower that is portable, durable, easy to operate and maintain. It also aims to design a self- powered mower of electrical source; a cordless electric lawn mower. The heart of the machine is a battery-powered DC electric motor. It comprises of a system of speed multiplication pulleys which drive the cutting blades and the charging unit comprising of a 12V alternator and a lift mechanism meant to alter the height of cut_ This is achieved by means of a system of pulleys with minimal slip effect; collapsible blades to reduce The common problem of wear. The use of collapsible blades and incorporation of an alternator for recharging the battery make the design unique such that no engage is involved. Performance test gave a cutting efficiency of 8.9.55% with 0.24kAt human effort. Thus, the machine is considered highly efficient and is readily adaptable to different cutting conditions.

Ankush P. Borekar [6]: This "solar powered vision based robotic lawn mower" is an autonomous lawn mower that will allow the user to the ability to c ut their grass with minimal effort. Unlike other robotic lawn mowers on the market, this design requires no perimeter wires to main tain the robot within the lawn and also with less human effort in the manual mode operation. There are some preset pattern installed in the robot, in the automatic mode operation no human effort needed for the operation and helps to cut different patterns in the lawn very easily with less time.. Through an array of sensors safety takes major consideration in the device, this robot will not only stay on the lawn, it will avoid and detect objects and humans. And also it detect the land boundaries and start

mowing upon the predefine pattern with the help of installed camera and MATLAB programming.

Venkatesh.k [7]: In our project we fabricate the grass cutting machine for the use of agricultural field, to cut the crops in the field. This is a new innovative concept mainly used in agricultural field. It is simple in construction and its working is easy. The components that are used are motor, gear arrangement, cam, chain and sprocket, lead screw, wheel, control unit. Below the gear arrangement cutting blade is fixed. When the motor starts running by the use of power supply, the shaft also rotates and that rotates the gear arrangement which is coupled with the motor. As the gear arrangement rotates the cam arrangement, it operates the sickle bar which tends to cut the plants or crops. The sickle bar has one is fixed cutter and another one is movable cutter which is placed on it. The whole set up is placed on a movable base which has a wheel arrangement.

Chapter-3

Components Description

3.1 Arduino Nano:

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by   controlling
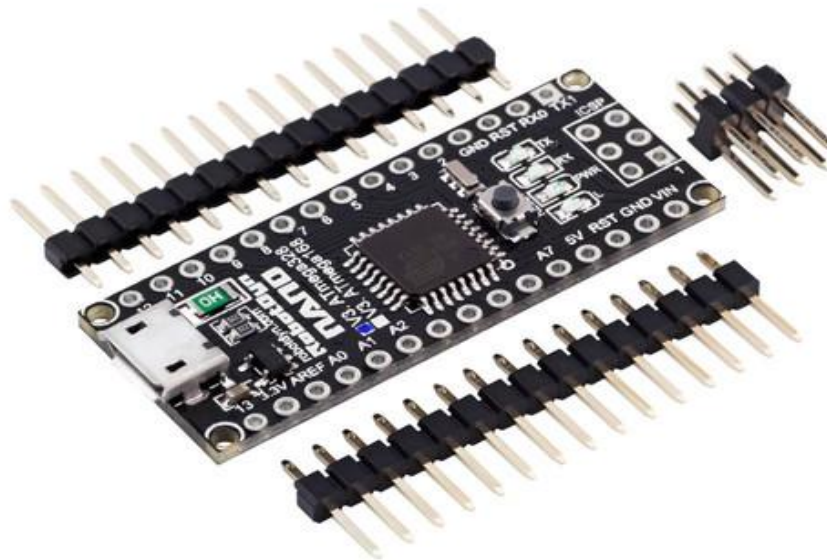
Lights, motors, and other actuators. **[8]**

Figure 3.1.1: Arduino Nano

The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing). Arduino projects can be stand-alone or they can communicate with software on running on a computer (e.g. Flash, Processing, MaxMSP).

Arduino Nano is a surface mount breadboard embedded version with integrated USB. It is a smallest, complete, and breadboard friendly. It has everything that Diecimila/Duemilanove has

(electrically) with more analog input pins and onboard +5V AREF jumper. Physically, it is missing power jack. The Nano is automatically sense and switch to the higher potential source of power. **[11]**
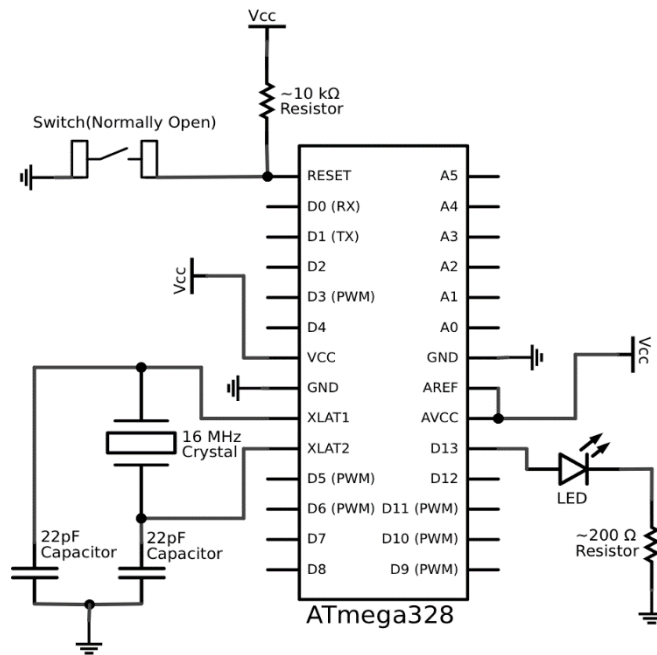

Figure 3.1.2**:** Arduino schematic diagram

Nano's got the breadboard-ability of the Boarduino and the Mini+USB with smaller footprint than either, so users have more breadboard space. It's got a pin layout that works well with the Mini or the Basic Stamp (TX, RX, ATN, GND on one top, power and ground on the other). This new version 3.0 comes with ATMEL MEGA328p which offer more programming and data memory space. It is two layers. That make it easier to hack and more affordable.
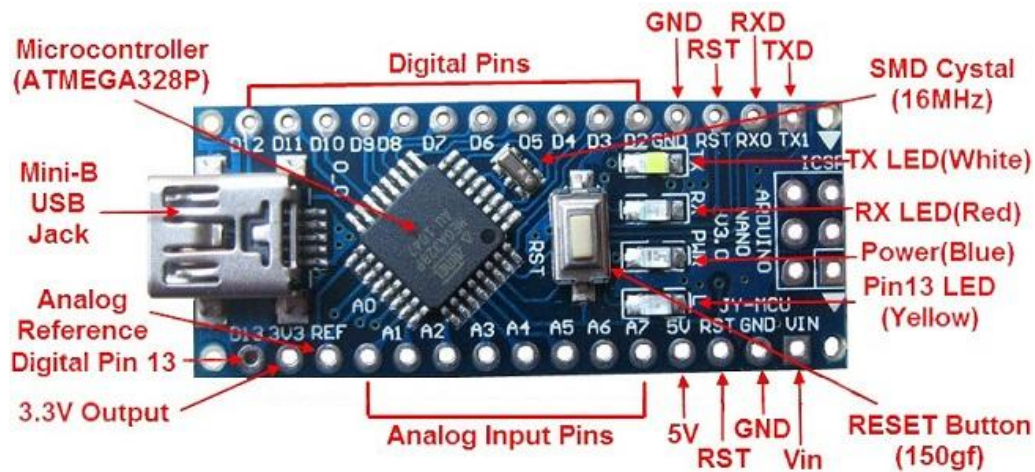
Figure 3.1.3: Section of Arduino Nano.

3.1.1 Specifications:

Microcontroller: ATMEL MEGA328p

Operating Voltage (logic level):5 V

Input Voltage (recommended):7-12 V

Input Voltage (limits):6-20 V

Digital I/O Pins: 14 (of which 6 provide PWM output)

Analog Input Pins: 8

DC Current per I/O Pin: 40 mA

Flash Memory: 32 KB (of which 2KB used by boot loader)

SRAM   : 2 KB

EEPROM: 1 KB

Clock Speed: 16 MHz

Dimensions: 0.70" x 1.70"

3.1.2 Features:

• Automatic reset during program download

• Power OK blue LED

• Green (TX), red (RX) and orange (L) LED

• Auto sensing/switching power input

• Small mini-B USB for programming and serial monitor

• ICSP header for direct program download

• Standard 0.1 spacing DIP (breadboard friendly)

• Manual reset switch

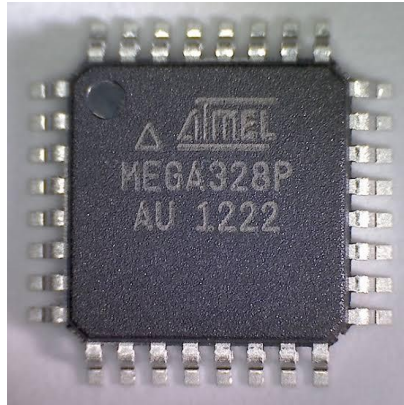### 3.1.3 Microcontroller IC ATMEL MEGA328p:

Figure 3.1.4: Microcontroller IC ATMEL MEGA 328p.

The high-performance Microchip Pico Power 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed. **[11]**

3.2 Bluetooth Module HC-05

Bluetooth is a wireless technology standard for exchanging data between fixed and mobile devices over short distances using short-wavelength UHF radio waves in the industrial, scientific and medical radio bands, from 2.400 to 2.485 GHz, and building personal area networks. **[12]**
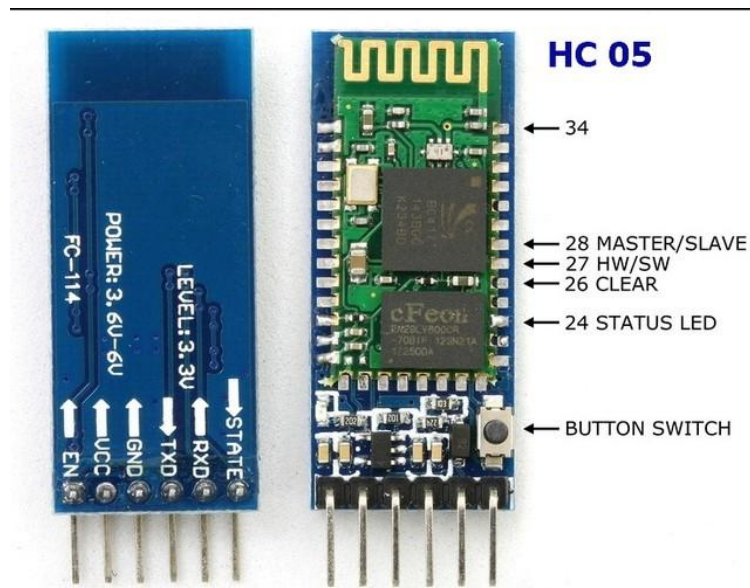
Figure 3.2.1: Bluetooth Module HC-05

3.2.1 HC-05 Technical Specifications

- Serial Bluetooth module for Arduino and other microcontrollers
- Operating Voltage: 4V to 6V (Typically +5V)
- Operating Current: 30mA
- Range: <100m
- Works with Serial communication (USART) and TTL compatible
- Follows IEEE 802.15.1 standardized protocol
- Uses Frequency-Hopping Spread spectrum (FHSS)
- Can operate in Master, Slave or Master/Slave mode
- Can be easily interfaced with Laptop or Mobile phones with Bluetooth
- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.   **[17]**

3.2.2 Applications

The **HC-05** is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. So if you looking

for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you. However do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.

1. Wireless communication between two microcontrollers

2. Communicate with Laptop, Desktops and mobile phones

3. Data Logging application

4. Consumer applications

5. Wireless Robots

6. Home Automation

3.2.3 How to Use the HC-05 Bluetooth Module

The **HC-05** has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description.

It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU as shown in the figure below….**[12]**
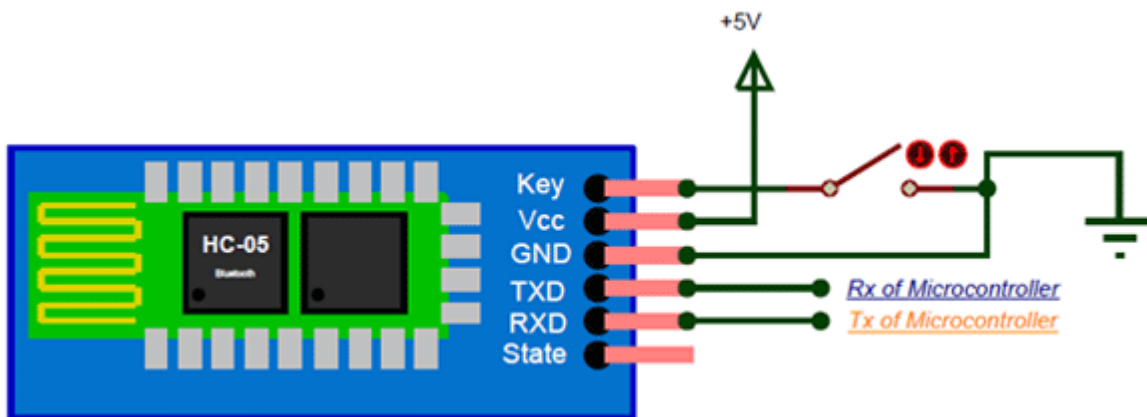

Figure 3.2.2: Use the HC-05 Bluetooth

During power up the key pin can be grounded to enter into Command mode, if left free it will by default enter into the data mode. As soon as the module is powered you should be

able to discover the Bluetooth device as "HC-05" then connect with it using the default password 1234 and start communicating with it. **[17]**

3.2.4 Pin Configuration of HC-05 Bluetooth Module

Pin Number	Pin Name	Description
1	Enable / Key	This pin is used to toggle between Data Mode (set low) and AT command mode (set high). By default it is in Data mode
2	Vcc	Powers the module. Connect to +5V Supply voltage
3	Ground	Ground pin of module, connect to system ground.
4	TX – Transmitter	Transmits Serial Data. Everything received via Bluetooth will be given out by this pin as serial data.
5	RX – Receiver	Receive Serial Data. Every serial data given to this pin will be broadcasted via Bluetooth
6	State	The state pin is connected to on board LED, it can be used as a feedback to check if Bluetooth is working properly.
7	LED	Indicates the status of Module • Blink once in 2 sec: Module has entered Command Mode • Repeated Blinking: Waiting for connection in Data Mode • Blink twice in 1 sec: Connection successful in Data Mode
8	Button	Used to control the Key/Enable pin to toggle between Data and command Mode

Table 3.2.4 : Pin Configuration of Bluetooth Module.   **[17]**

3.3 Transformer

A transformer is an electrical device used to change the value of an alternating voltage. Transformers are widely used in electrical work. They are encountered daily, in industrial, commercial and domestic situations. They vary in size from miniature units used in electronics to huge units used in power stations. The efficient transmission and distribution of electricity throughout the country would be impossible without the use of power transformers.

Transformers are also used for safety reasons on construction sites when using power tools and in domestic bathroom situations in shaver units. They are used in doorbell operation and also to power electronic equipment, battery chargers, televisions, computers, alarm systems, etc. Transformers vary considerably in construction, size and shape depending on their application. **[13]**

Transformer Symbols:

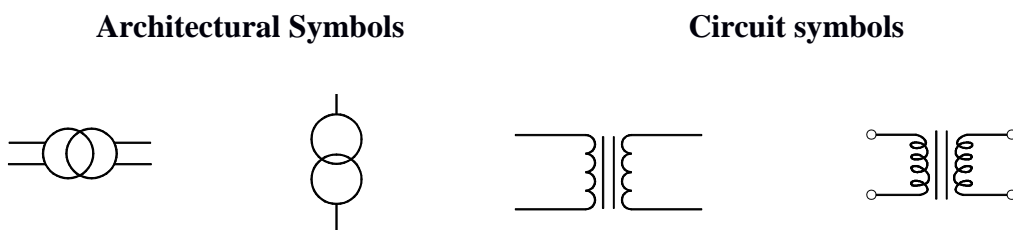**Architectural Symbols**   **Circuit symbols**

Figure 3.3.1: Transformer Circuit Symbol

Transformer Construction:

A transformer consists of two coils of wire called windings, which are wound onto a common iron core. The wire used in the two windings, primary and secondary, is coated with an insulating varnish. Both coils are wound onto, but insulated from the iron core. **[18]**
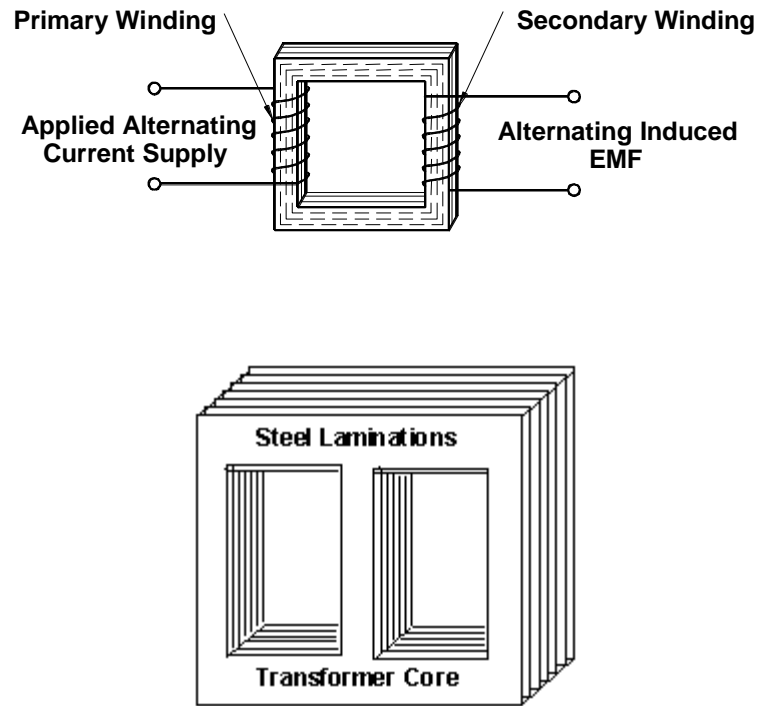
Fig:3.3.2: Transformer Construction.

3.3.1 The Transformer Principle:

When a conductor or coil is moved in a stationary magnetic field it cuts the lines of magnetic flux and an EMF is induced in the conductor or coil. This same principle also applies when a conductor is held stationary and the magnetic flux is made to change or vary. **[19]**

Now consider an alternating current applied to a stationary coil. A magnetic field will build up and collapse in the coil, continually rising and falling in harmony with the applied AC current as shown in Figure 3.3.3
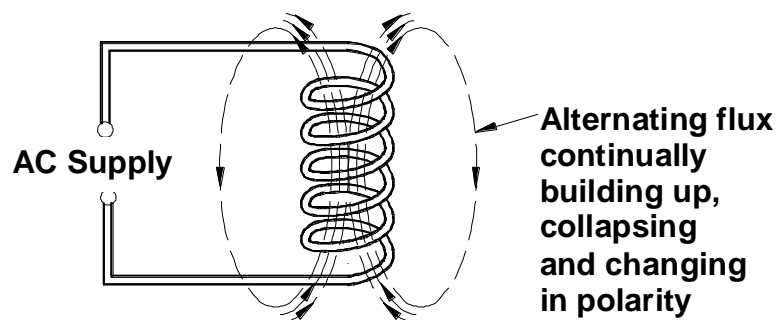

Figure 3.3.3: AC Supply

If a second coil (coil 2) is placed close to the first coil (coil 1) the alternating magnetic flux in coil 1 links with coil 2. See Figure 4. This results in an EMF being induced in coil 2. This is a process known as mutual induction
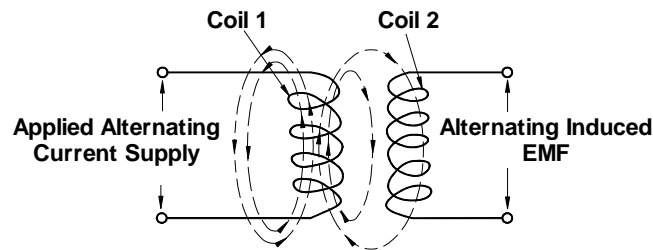

Figure 3.3.4: Coil

If coil 1 and coil 2 are mounted on an iron core the magnetic flux around both coils will be concentrated. This arrangement of coils and an iron core form the complete device known as a transformer. See Figure 3.3.4 **[19]**

3.4 Battery**:**

The Battery is an electric device. The number of batteries required depends on the load requirement.

A **lead acid battery** is a secondary_cell, meaning that it is rechargeable. It is very common in cars and trucks. It contains plates of lead and lead(IV) oxide in a sulfuric_acid solution. The lead(IV) oxide oxidizes the lead plate, making an electrical_current.

Lead-acid batteries are the cheapest rechargeable_batteries and can produce much power. They contain toxic lead, though, and should be recycled. They are wet_cells, and the dangerous acid can spill out. Sealed_lead_acid_batteries are batteries where the sulfuric acid is in a gel which stays in, even when the battery is turned up side down. **[9]**

Figure 3.4: Battery

These are small Sealed Lead Acid batteries that are generally used for semi-portable appliances that need more power or a fair bit of power (more than can be provided by D, C or AA cells) for a longish time. They are typically used for people who go caving, or for lighting for an overnight camping trip where you are travelling on foot. The amp-hour rating tells you how long the battery will last before it goes flat. For example, a 7.2Ah battery will give 7.2 amps for one hour or 3.6 amps for 2 hours or 1.8 amps for 4 hours, etc. Generally an adequate amount of current for a lantern. **[9]**

3.5 Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the sometime, act to lower voltage levels within circuits. Resistors may have fixed resistances or variable resistances, such as those founding thermostats, visitors, trimmers, photo resistors, hamsters and potentiometers. The current through a resistor is in direct proportion to the voltage across the resistor's terminals. This relationship is represented by Ohm's law. **[14]**

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Figure. 3.5 : Resistor

3.5.1 Theory of operation

The behavior of an ideal resistor is dictated by the relationship specified by Ohm 'slaw:

$$V = I.R$$

Ohm's law states that the voltage (V) across a resistor is proportional to the current(I), where the constant of proportionality is the resistance (R).

Equivalently, Ohm's law can be stated:

$$I = V/R$$

This formulation states that the current (I) is proportional to the voltage (V) and inversely proportional to the resistance (R). This is directly used in practical computations. For example, if a 300 ohm resistor is attached across the terminals of a12 volt battery, then a current of12 / 300 = 0.04 amperes flows through that resistor.

3.6 DC Gear Motor

A gear motor is an all-in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output. The most important parameters in regards to gear motors are speed (rpm), torque (lb-in) and efficiency (%). In order to select the most suitable gear motor for your application you must first compute the load, speed and torque requirements for your application. ISL Products offers a variety of Spur Gear Motors, Planetary Gear Motors and Worm Gear Motors to meet all application requirements. Most of our DC motors can be complimented with one of our unique gearheads, providing you with a highly efficient gear motor solution. **[15]**

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Figure 3.6: DC Gear Motor

3.6.1 Types of DC Motors/Gear motors

The most common electrical motors convert electrical energy to mechanical energy. These types of motors are powered by direct current (DC).   [15]

- Brushed
- Brushless (BLDC)
- Planetary Gear Motors
- Spur Gear Motors
- Stepper
- Coreless & Coreless Brushless
- Servo
- Gear heads

3.6.2 Motor Specifications

Once the design calculations are performed, and the application parameters are defined, you can use this data to determine which motor or gear motor will best fit your application. Some of the most common specs to consider when selecting a motor or gear motor would be: **[15]**

- Voltage
- Current
- Power
- Torque
- RPM
- Life Expectancy / Duty Cycle
- Rotation (CW or CCW)
- Shaft Diameter and Length
- Enclosure Restrictions

3.7 Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. **[22]**

Figure 3.7: Relay

3.8 Blades

A blade is that portion of a tool, weapon, or machine with an edge that is designed to cut and/or puncture, stab, slash, chop, slice, thrust, or scrape surfaces or materials. The blade is seldom sharp enough to give a neat cutting. The blade simply tears the grass resulting in brown tips. However, the horizontal blades are easy to remove and sharpen or replace. Existing engine trimmers suffer from high initial cost, high levels of engine noise, high fuel consumption rates and high operator's fatigue in long-run. Mower blades are the cutting components of lawn mowers. They are usually made of sturdy metals as they must be able to withstand high-speed contact with a variety of objects in addition to grass. The materials used (as well as size, thickness, and design of the blades) vary by manufacturer. A blade may be made from a flaking stone, such as flint, metal (usually steel), ceramic, or other material. Here we used two blades i.e. fixed blade and sliding blade.

Figure 3.8: Blades for Cut the grasses

Specification:

Material-MS,

Dimension-3.5"x0.10"

Cutting Radius- 8"

3.9 Full Wave Bridge Rectifier:

The four diodes labelled D_1 to D_4 are arranged in "series pairs" with only two diodes conducting current during each half cycle. During the positive half cycle of the supply, diodes D1 and D2 conduct in series while diodes D3 and D4 are reverse biased and the current flows through the load. **[21]**

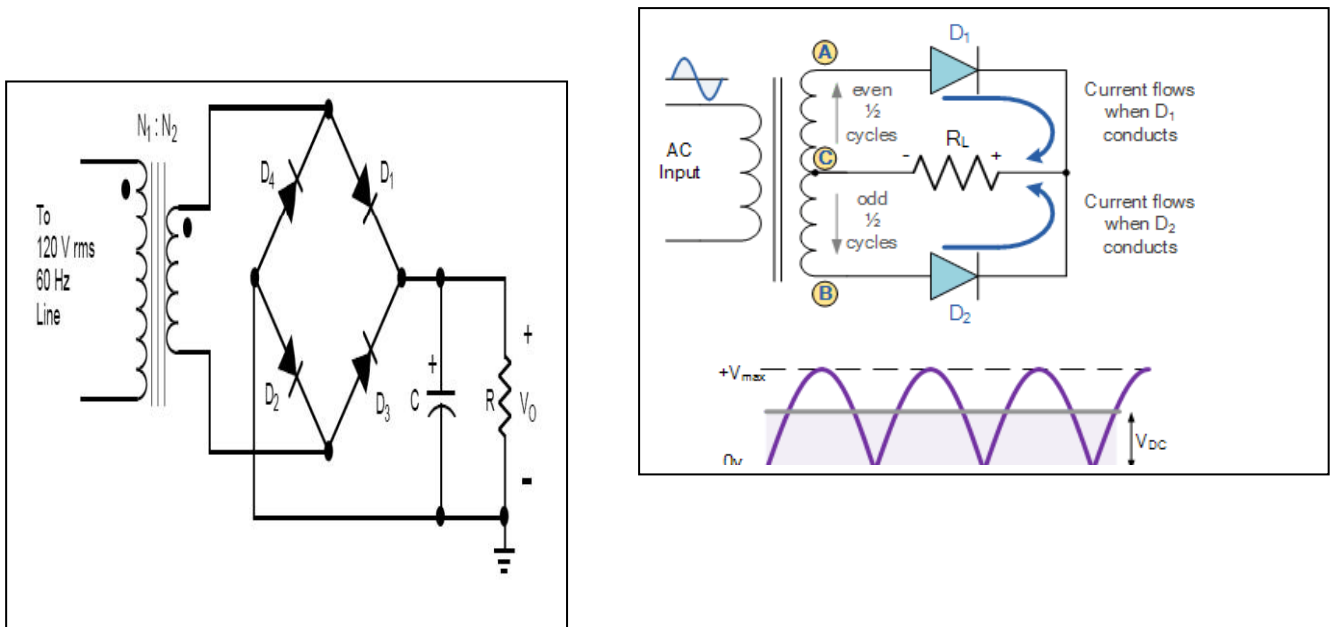Figure 3.9.2: A Circuit Diagram Of Full Wave Bridge Rectifier.

Chapter-4

Software Description

4.1 Arduino software

The smart microcontroller unit named as Arduino Nano can be programmed with the Arduino software. There is no any requirement for installing other software rather than Arduino. Firstly, Select "Arduino Nano from the Tools, Board menu (according to the microcontroller on your board). The IC used named as ATmega328 on the Arduino Nano comes pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer.

Communication is using the original STK500 protocol (reference, C header files). We can also bypass the boot loader and programs the microcontroller through the ICSP (In Circuit Serial Programming) header. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

 On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.   On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode. **[20]**

 The Arduino Nano is one of the latest smart microcontroller units and has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL at (5V) with serial communication, which is available on digital pins 0 -(RX) for receive the data and pin no.1 (TX) for transmit the data. An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. **[20]**

The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial Communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Nano's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus. Arduino programs are written in C or C++ and the program code written for Arduino is called sketch. The Arduino IDE uses the GNU tool chain and AVR Libc to compile programs, and for uploading the programs it uses avrdude. As the Arduino platform uses Atmel microcontrollers, Atmel's development environment, AVR Studio or the newer Atmel Studio, may also be used to develop software for the Arduino. [20]

4.2 Proteus

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

The first version of what is now the Proteus Design Suite was called PC-B and was written by the company chairman, John Jameson, for DOS in 1988. Schematic Capture support followed in 1990, with a port to the Windows environment shortly thereafter. Mixed mode SPICE Simulation was first integrated into Proteus in 1996 and microcontroller simulation then arrived in Proteus in 1998. Shape based auto routing was added in 2002 and 2006 saw another major product update with 3D Board Visualization. More recently, a dedicated IDE for simulation was added in 2011 and MCAD import/export was included in 2015. Support for high speed design was added in 2017.Feature led product releases are typically biannual, while maintenance based service packs are released as required. [16]
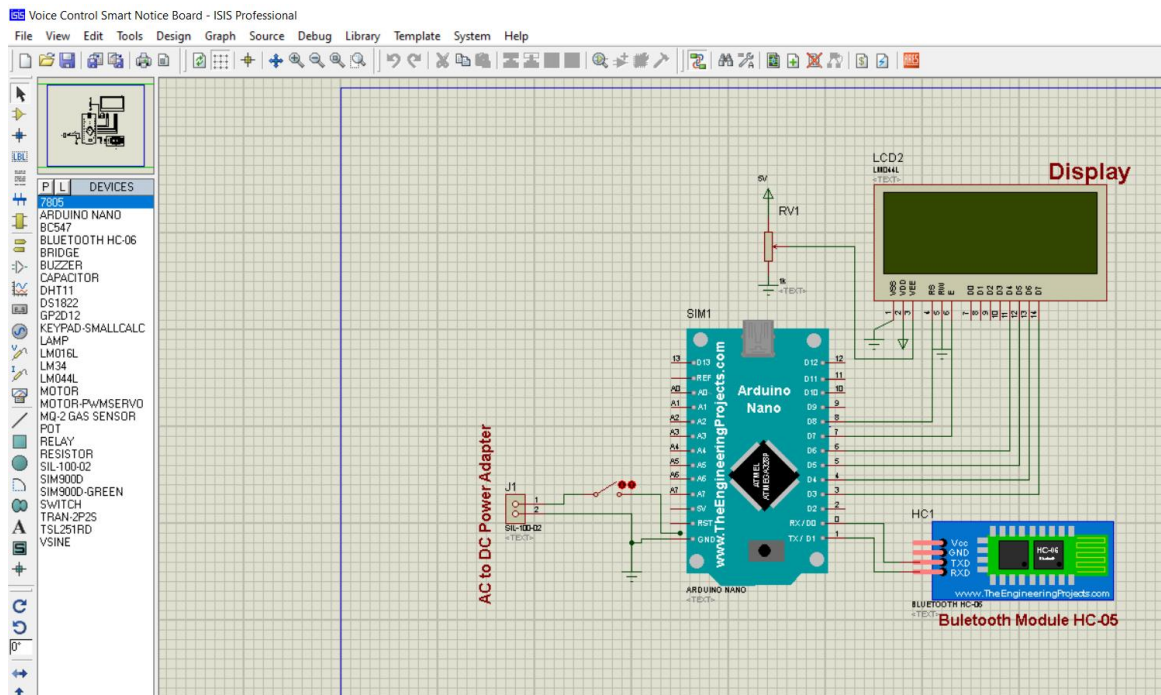
Figure 4.2: Proteus Software Interface.

4.3 PCB Design of Proteus

In this post I will take you through process of designing the printed circuit board in Proteus. If you are an electronics engineer then you should have the skills from the schematic design to the printed circuit board design. There are a lot tools for designing the printed circuit board but the most common and easiest is the Proteus. The Proteus is very popular among the professionals and students because of its large number of capabilities. The Proteus software can be used for schematics drawing, simulation of circuits, printed circuit board design and three dimensional visualization of the printed circuit board.

After reading this post you will be able to learn the schematic drawing in Proteus and the designing of the printed circuit board in the Proteus, you will also learn about how to visualize the three dimensional view of the circuit in Proteus. So sit back, keep reading and enjoy learning. **[16]**
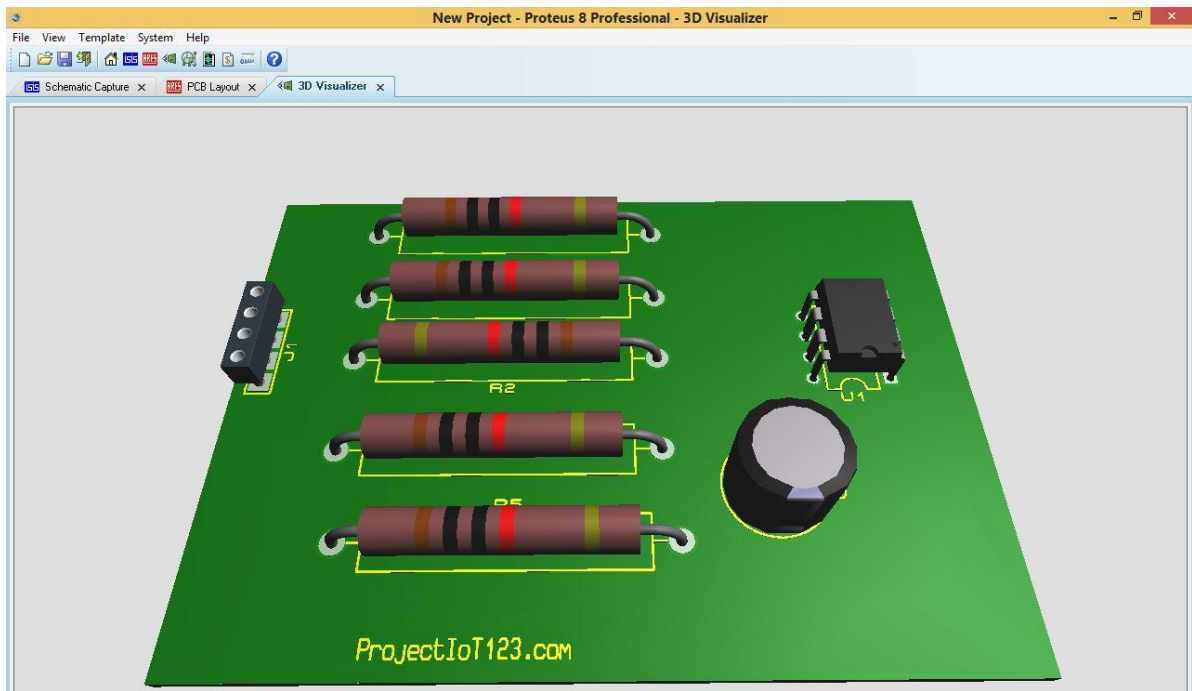
Figure 4.3: PCB design of proteus.

Chapter-5
Working Principal

5.1 System Description

Above circuit diagram speaks it all for the sake of this project. The Solar Panel will be connecting through pin 1 and 16 to solar charger controller, the out pins (2 and 4) are connected to battery pin as shown in the circuit diagram now we are more than half way mark. Connect the gear motors to the shown pin of Motor Driver and the motor driver will connect to Arduino pin 6,7,8,9,10. Now comes the Bluetooth module and which will have its Rx,Tx pin connected with Tx,Rx pin of Arduino respectively. Battery or power adapter of 5-6V is required. So, data sent to the Bluetooth module using mobile or any Bluetooth enabled devices through Bluetooth terminal apps are fetched to the Arduino and control the Movement of Lawn Mower.
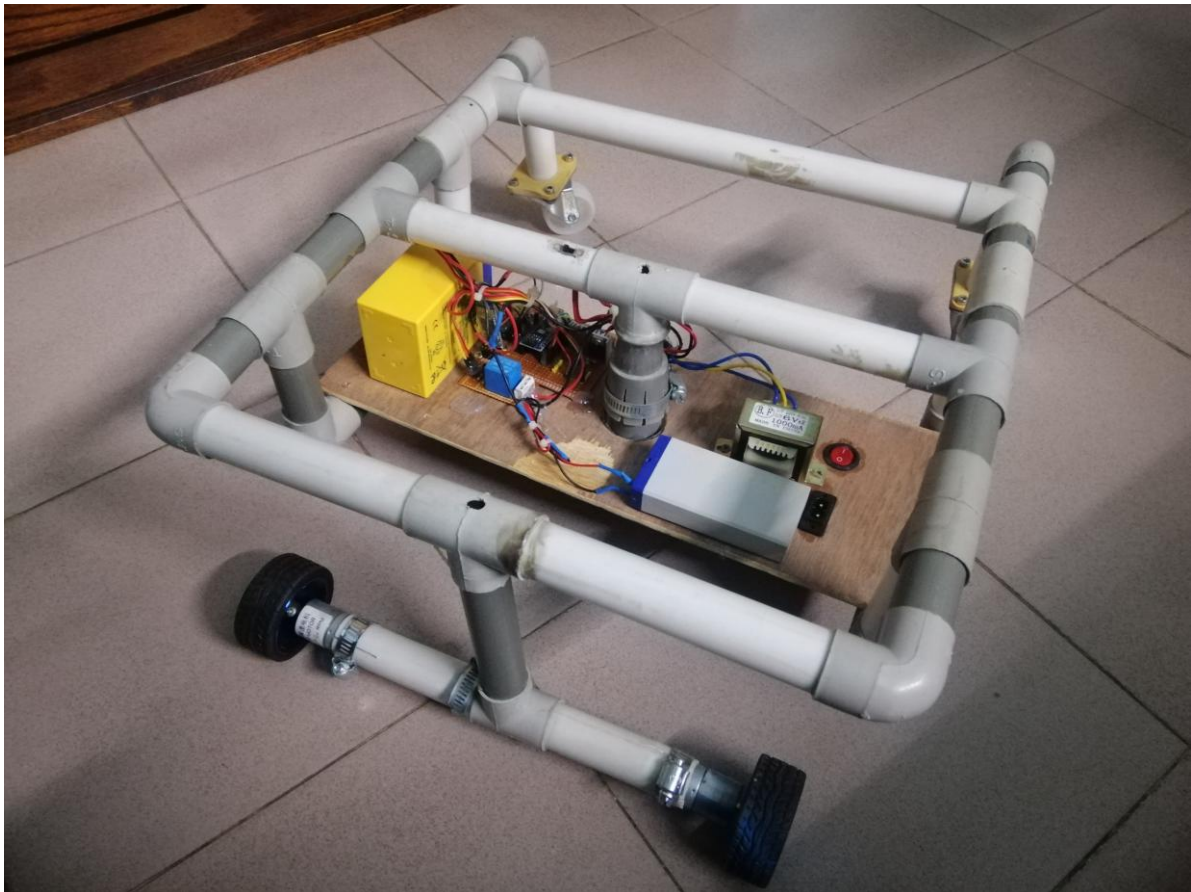

Figure 5.1: Final project.

This document deals with an innovative rather an interesting manner of intimating the message to the people using a wireless electronic display board which is synchronized using the Bluetooth technology. This proposed technology can be used in colleges many public places, malls or big buildings to enhance the security system and also make awareness of the emergency situations and avoid many danger

5.2 Block Diagram

In this project we have used Bluetooth module for wireless communication between our smart phone & our designing project. This Bluetooth module connected the ArduinoRX & TX pin. And control the movement of that lawn mower.
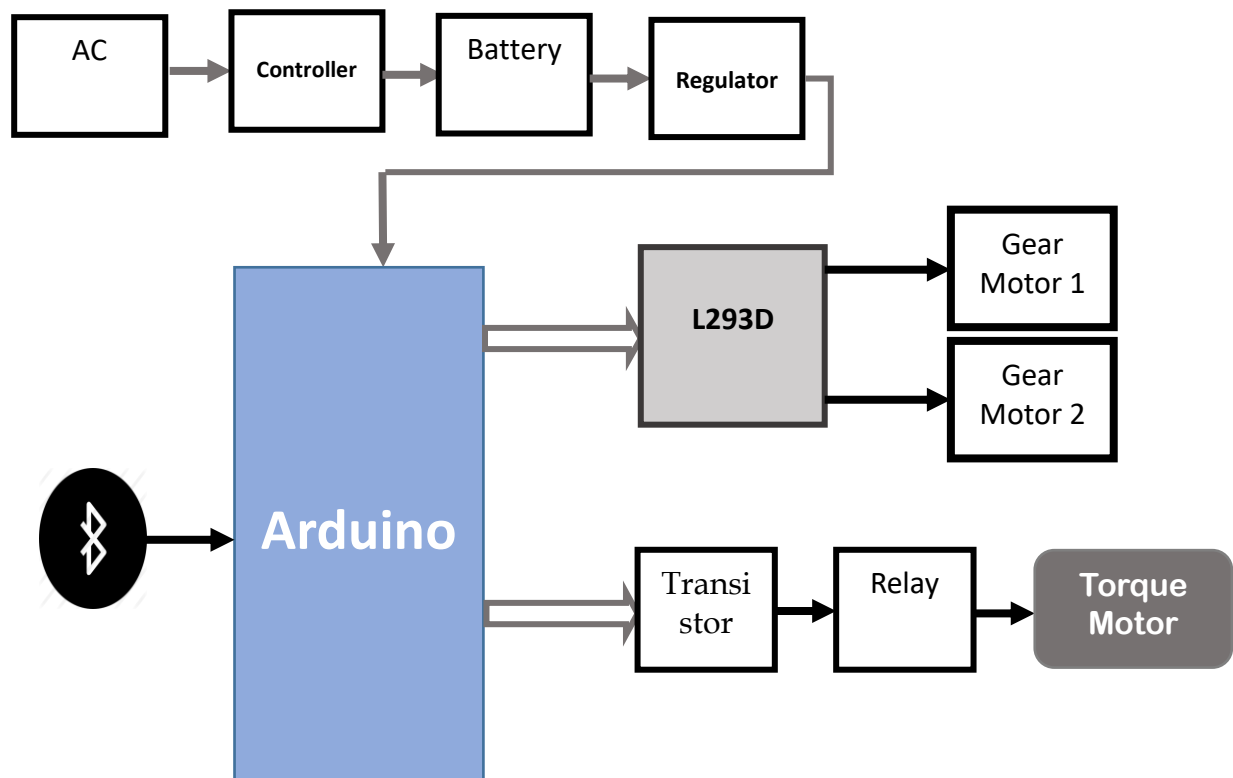

Figure 5.2: Block Diagram of Android Control Notice Board
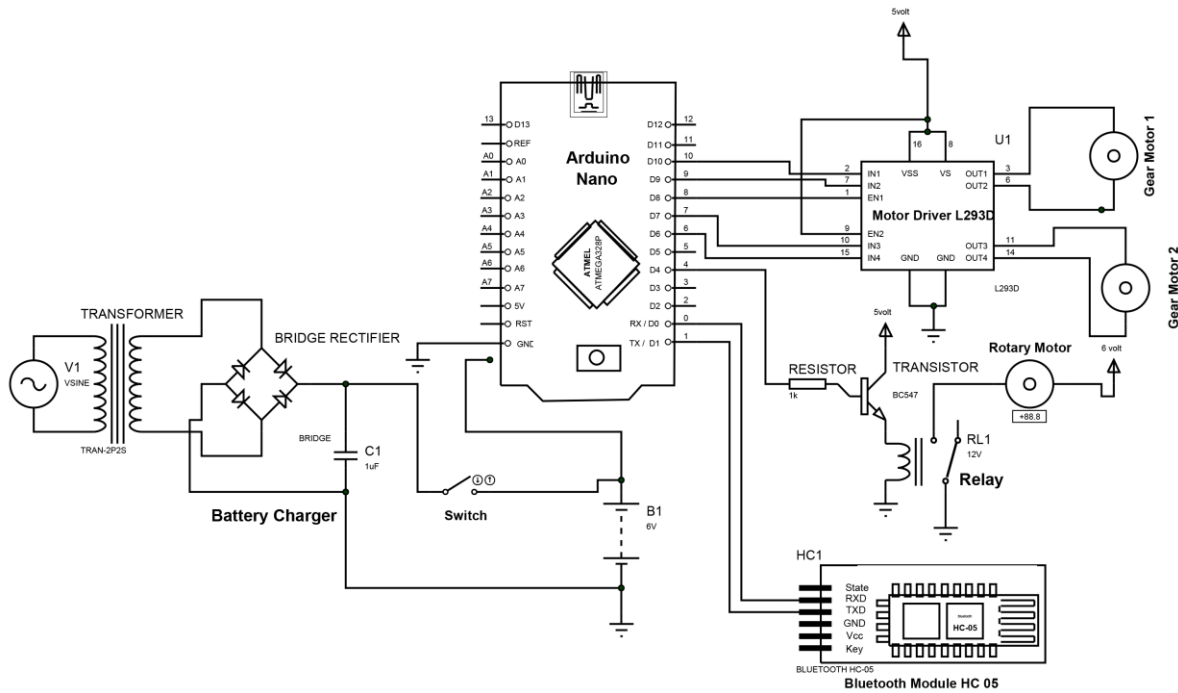
5.3 Schematic Diagram

Figure 5.3: Schematic Diagram of Android Control Notice Board.

5.4 Working Principle

This system work with AC Power as the power will be store from AC through battery, from there the full function will be power generate, then 2 Gear DC Motors with **L293D** Motor driver will be connect through Arduino nano, so it can move forward and backward. Now we setup a transistor and a relay between the torque motor and Arduino. So we can control a 12 volt torque or any other maximum motor giving input logical high 1 and low 0 from Arduino pin. And last we connect a Bluetooth module with Arduino so we can control this Lawn Mower with our android devices. when the pin get 1 the torque motor will start to cut the grasses. We design a pipe model which will contain the device, motors and battery to work.
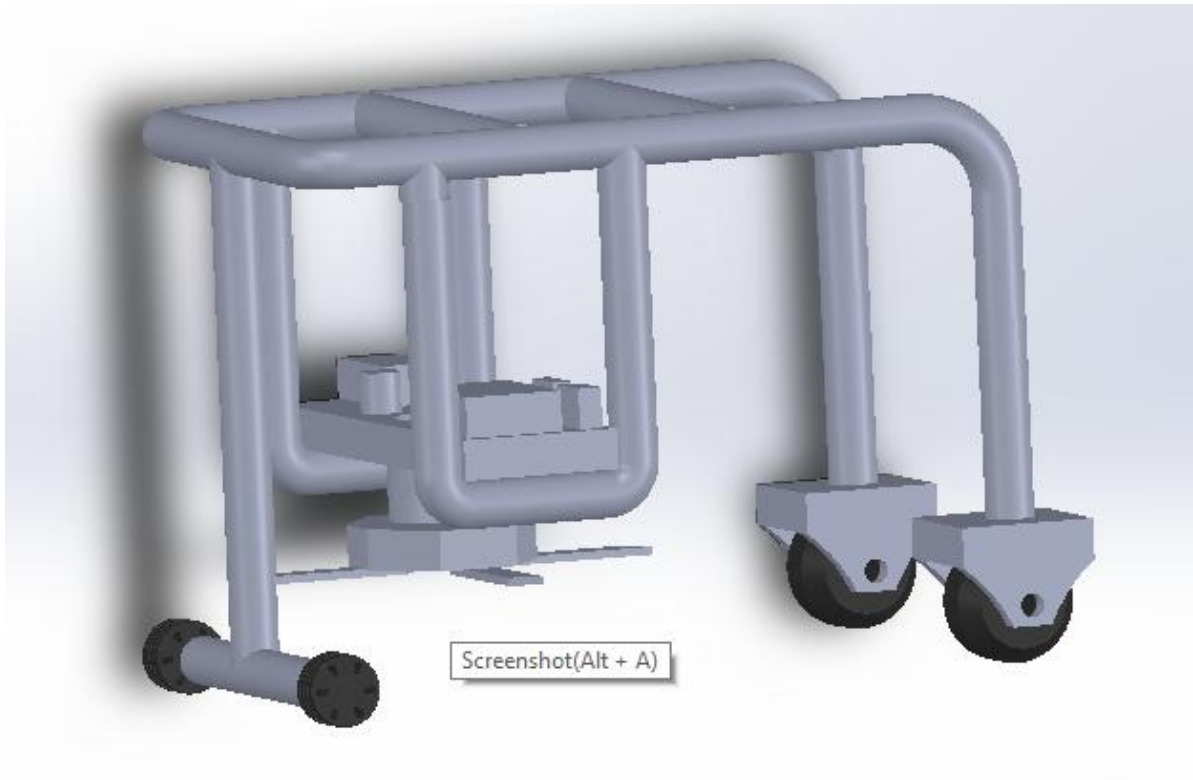
5.5 3D Figure of Automatic Lawn mower

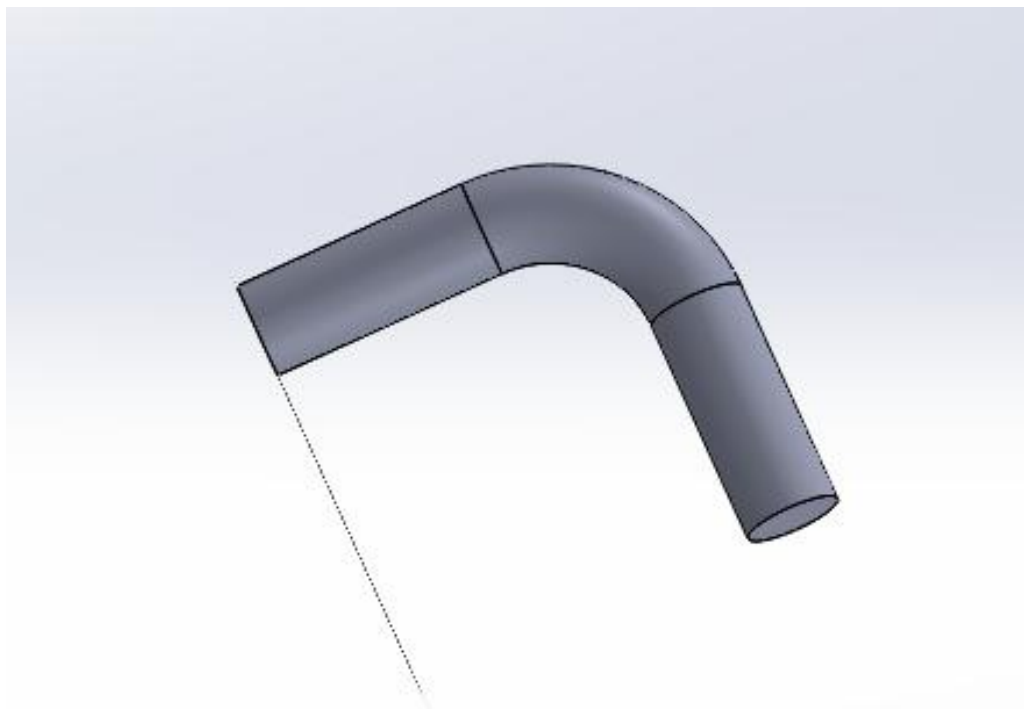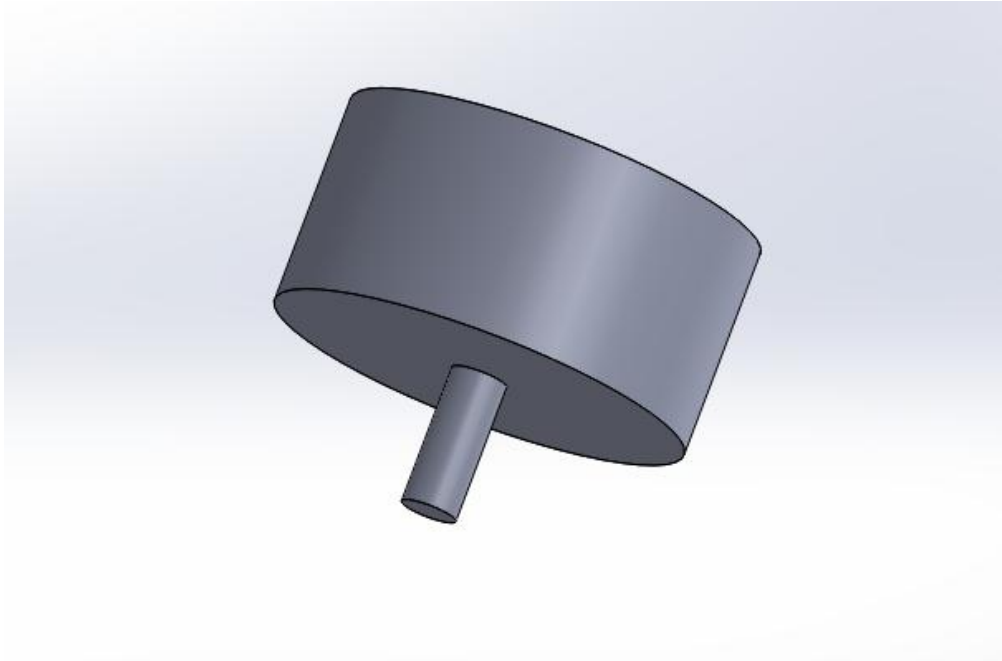Figure 5.5.1: 3D Figure Of Automatic Lawn mower

Figure 5.5.2: Elbow
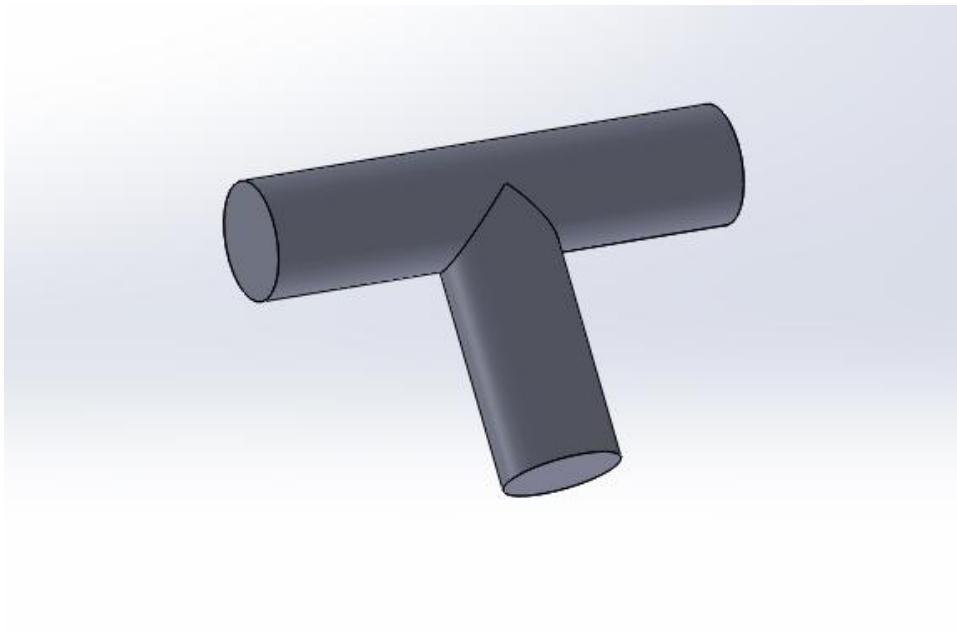
Figure 5.5.3: 3D Figure Of Motor

Figure 5.5.4: 3D Figure Of Tee
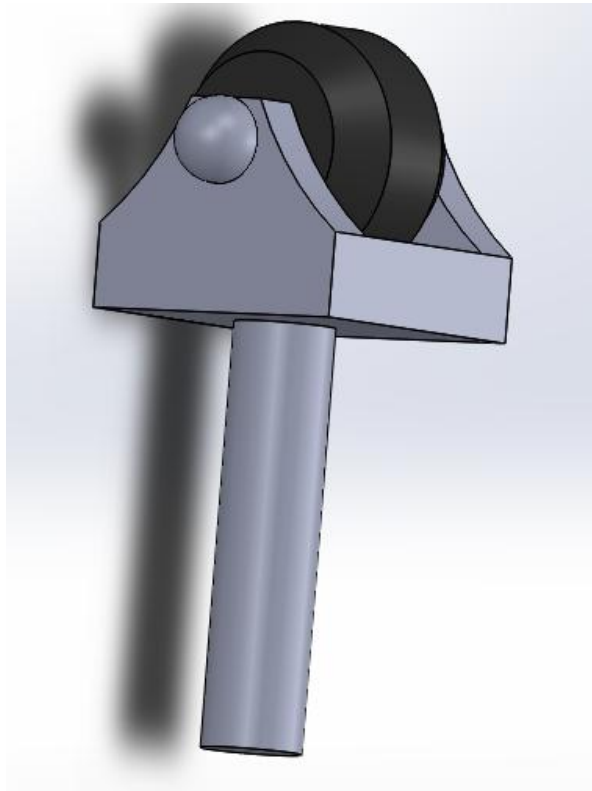
Figure 5.5.5: 3D Figure Of U

Figure 5.5.6: 3D Figure Of Forward Wheel.

Figure 5.5.7: 3D Figure Of Main Frame With Wheel.

5.6 List of Components with Price

Sl.no	Particulars	Specification	Qty.	Unit Price (Taka)	Total Price (Taka)	Market Price
1	Arduino Nano	ATMEL MEGA 328p	1	280	280	
2	Brashless Motor		1	100	100	
3	Bluetooth Module		1	250	250	
4	IR Sensor		1	150	150	
5	L293D Motor Driver IC		3	45	135	
6	Buzzer		1	10	10	
7	12 volt step Down Transformer	1A	1	120	120	
8	Diode		1	15	15	
9	7805 Voltage Regulator IC		2	7	14	
10	Capacitor		2	10	20	
11	Others			800	800	
		Total		1894/=		
						3500/-

Table 5.6: List of Components with Price.

5.7 Program For Android Operation.

```
String voice;

int
led1 = 9,
led2 = 10,
led3 = 6,
led4 = 5,
relay = A0;
void setup() {
Serial.begin(9600);
pinMode(led1, OUTPUT);
pinMode(led2, OUTPUT);
pinMode(led3, OUTPUT);
pinMode(led4, OUTPUT);
pinMode(relay, OUTPUT);


}

void loop() {

  while (Serial.available()){
delay(10);
  char c = Serial.read();
  if (c == '#') {break;}
  voice += c;
  }

if (voice.length() > 0){

Serial.println(voice);

 // Serial.println();


  if (voice == "F")
          {
          // ll=1;
```

```
analogWrite(led1,255);
digitalWrite(led2,LOW);
analogWrite(led3,255);
digitalWrite(led4,LOW);
          }
else if (voice == "B" )
          {
           //ll=0;
digitalWrite(led1,LOW);
analogWrite(led2,255);
digitalWrite(led3,LOW);
analogWrite(led4,255);
          }

else  if (voice == "L")
          {

analogWrite(led1,255);
digitalWrite(led2,LOW);
digitalWrite(led3,LOW);
digitalWrite(led4,LOW);


          }

else  if (voice == "R")
          {
          //   ll=0;
digitalWrite(led1,LOW);
digitalWrite(led2,LOW);
analogWrite(led3,255);
digitalWrite(led4,LOW);


          }

else  if (voice == "S")
{
digitalWrite(led1,LOW);
digitalWrite(led2,LOW);
digitalWrite(led3,LOW);
digitalWrite(led4,LOW);
}
```

```
else  if (voice == "x")
{
digitalWrite(relay,LOW);
}
else  if (voice == "y")
{
digitalWrite(relay,HIGH);
}


}


voice="";
}
```

//Reset the variable after initiating

Chapter-6
DISCUSSION & CONCLUSION

6.1 Discussion:

From the received data during the tests it has been seen that the total machine consumes a Medium amount of power which is so effective and little cost saving. The discharge rate is so adequate and high in value on the other hand charging capacity is remarkable and is too fast along the requirement. There is a few noise occur during grass cutting and rotating the machine because of high power of torque motor. A little problem arise there and that is the high rpm of torque motor though it has a benefit also and for the high rpm the machine move fast and cut the grass rashly.

6.2 Future Recommendation:

- It can be used for industrial applications.

- In future, it can be complately cloud based.

- Arduino can be replaced by upgraded Microcontroller or chip.

- More sensors can be used for further application.

- High range ultrasonic sensor can be used.

6.3 Conclusion

Our project entitled Fabrication of AC powered grass cutter is successfully completed and the results obtained are satisfactory. It will be easier for the people who are going to take the project for the further modifications. This project is more suitable for a common man as it is having much more advantages i.e, no fuel cost, no pollution and no fuel residue, less wear and tear because of less number of moving components and this can be operated by using AC supply energy. This will give much more physical exercise to the people and can be easily handled. The initial investments of the battery powered grass cutter are high.This system is having facility of charging the batteries while the AC powered grass cutter is in motion. So it is much more suitable for grass cutting also. The same thing can be operated in night time also, as the battery recharge from AC power.

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