# DAYANANDA SAGAR UNIVERSITY

## School of Engineering, Kudlu Gate, Bangalore-560068



## CERTIFICATE

This is to certify that Mr. DEVA BHARGAV.K, KIRAN.M, GOWTHAM.R,   GOWTHAM .B, bearing    USN    ENG17CS0107,ENG17CS0111,ENG17CS0078,ENG17CS0077    has satisfactorily completed their Mini Project as prescribed by the university for the III/3rd semester B.Tech. program in Computer Science and Engineering during year 2018-19 at School Of  Engineering,Dayananda sagar university,Bangalore.

Date: _____                                        _____

                                                                    Signature of the faculty in-charge

| Max Marks | Marks Obtained |
|---|---|
|  |  |

_____

Signature of Chairman

Department of Computer Science & Engineering

## DECLARATION

We hereby declare that the work presented in this mini project entitled-
" **CONTROLLING MOTOR SPEED USING ESC AND ARDUINO** ", has
been carried out by us and it has not been submitted for the award of any
degree, diploma or the mini project of any other college or university.

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# ACKNOWLEDGEMENT

The satisfaction that accompanies the successful completion of task would be incomplete without the mention of the people who made it possible and whose constant guidance and encouragement crown all the efforts with success.

We are especially thankful to our **Chairman, Dr. M K Banga**, for providing necessary departmental facilities, moral support and encouragement.

We are very much thankful to **Prof. Rashmi Mothkur**, for providing help and suggestions in completion of this mini project successfully.

We have received a great deal of guidance and co-operation from our friends and we wish to thank all that have directly or indirectly helped us in the successful completion of this project work.

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# ABSTRACT

Ever thought to control Brushless Motor with ESC without a Transmitter and Receiver or have a Project in which you want to control Brushless Motor speed using a simple Circuit or Arduino, then there is a way we can do it with Arduino Micro-controller.This involves the use of PWM signal from Arduino to control brushless motor speed with an ESC.This will save you the money to buy a servo tester or an RC Transmitter and receiver.So Let's Get started!!

# Chapter 1

# INTRODUCTION

The term ESC stands for an "electronic speed control <u>is an electronic circuit used to change the speed of an electric motor, its route and also to perform as a dynamic brake. These are frequently used on</u> radio controlled models which are electrically powered, with the change most frequently used for brushless motors basically providing an **electronically produced 3-phase electric power** low voltage source of energy for the motor. An ESC can be a separate unit which lumps into the throttle receiver control channel or united into the receiver itself, as is the situation in most toy-grade R/C vehicles. Some R/C producers that connect exclusive hobbyist electronics in their entry-level vehicles, containers or aircraft use involved electronics that combine the two on a sole circuit board.
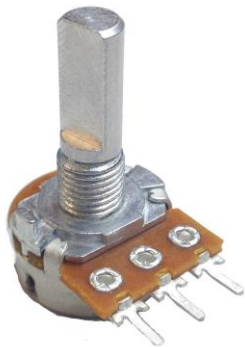
# Chapter 2
## COMPONENTS REQUIRED

**Hardware:**

Arduino UNO

Electronic Speed Controller

Brushless DC Motor
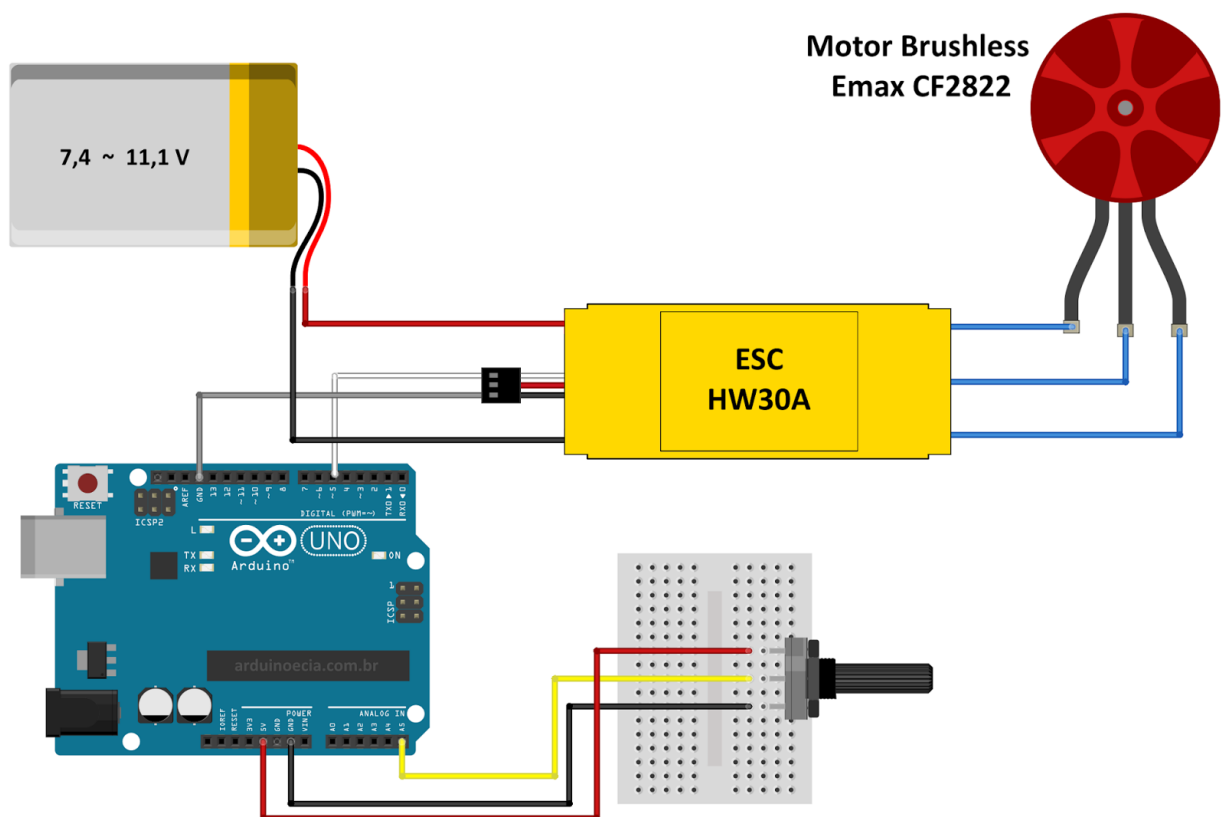
Jumper Wires

Potentiometer
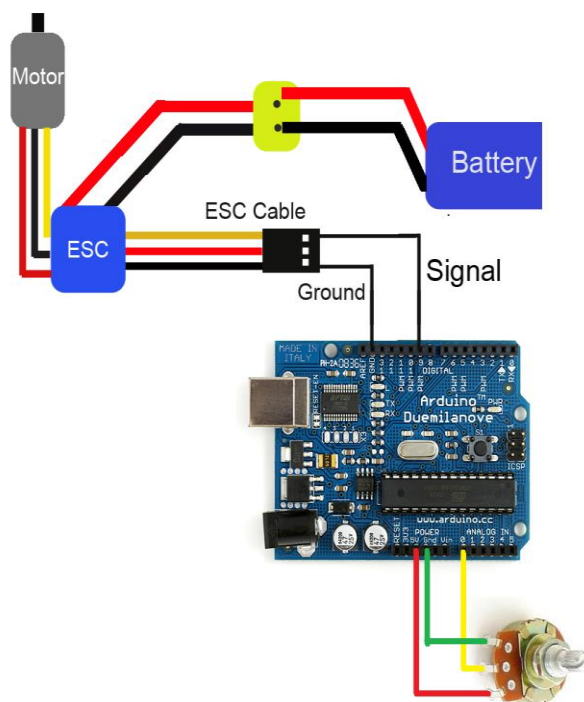
Power Supply

**Software:**



Arduino IDE

# Chapter 3
# DESIGN METHOD

## Circuit diagram

# ARCHITECTURE OF THE PROJECT



The electronic speed controller mainly has 3 input and 3 output and two power supply terminals .The three input terminals are connected to the Arduino board and the three output terminals are connected to the three terminals of a brushless DC motor.The input terminals which comprises positive ,negative  and signal terminals are connected to  +3.3 V, ground(gnd) and   8$^{th}$ pin of the arduino respectively.The power supply terminals are connected to the +ve and –ve terminals of the battery.


Potentiometer also has three terminals namely positive,negative and signal which are connected to +5V, ground(GND),A0 PIN of the arduino.

# WIRING UP THE CIRCUIT

First, connect the three terminals of Brushless motor to the three terminals of the ESC.Screw the Motor to a heavy wooden plank anything similar so that it remains stable at high RPM.Download and Flash the code available at the bottom of the page to the Arduino using a USB cable(Code is explained in the further part of this page). Connect the signal wire of ESC mostly white or yellow color to any PWM pin, Arduino, I connected it to the D8 pin and specified it a Pin 8 in the Arduino Sketch.You can use more than one pins for controlling many motors.

Connect the Potentiometer to the VCC or 5v pin of the Arduino and the Ground.

Connect the third terminal that is the variable pin to the Analog pin A0 You can power the Arduino using the BEC(Battery Eliminator Circuit)Present in your ESC.To use the BEC just connect the red thick wire to the Vin Pin of Arduino.It can provide 5V.Not all ESC's have a BEC, in this case, you can use an external 5v power supply.After Powering the Arduino now connect the Lipo battery to your ESC.

We are Done!!Now slowly turn the Potentiometer Knob to start and increase the speed of the Motor.

# Chapter 4
## COMPONENTS DESCRIPTION

## WORKING:

### ELECTRONIC SPEED CONTROLLER:

An electronic speed control follows a speed reference signal (derived from a throttle lever, joystick, or other manual input) and varies the switching rate of a network of field effect transistors (FETs) . adjusting the duty cycle or switching frequency of the transistors, the speed of the motor is changed. The rapid switching of the transistors is what causes the motor itself to emit its characteristic high-pitched whine, especially noticeable at lower speeds.

Different types of speed controls are required for brushed DC motors and brushless DC motors. A brushed motor can have its speed controlled by varying the voltage on its armature. (Industrially, motors with electromagnet field windings instead of permanent magnets can also have their speed controlled by adjusting the strength of the motor field current.) A brushless motor requires a different operating principle. The speed of the motor is varied by adjusting the timing of pulses of current delivered to the several windings of the motor.

Brushless ESC systems basically create three-phase AC power, as in a variable frequency drive , to run brushless motors. Brushless motors are popular with radio controlled airplane hobbyists because of their efficiency, power, longevity and light weight in comparison to traditional brushed motors. Brushless AC motor controllers are much more complicated than brushed motor controllers.
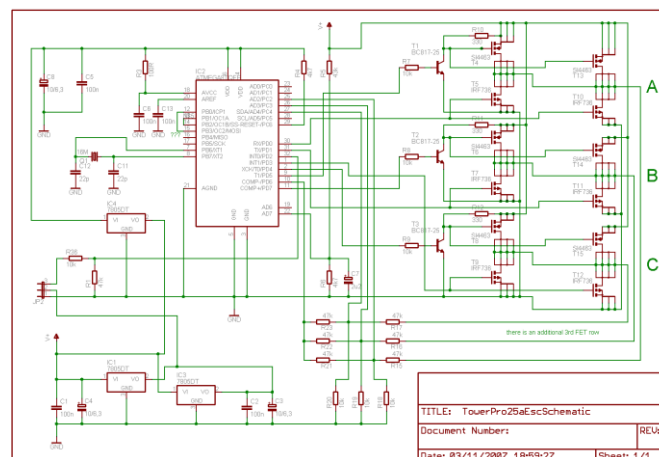
## BRUSHLESS DC MOTOR:

Just like any other electric motor, a BLDC motor also has a stator and a rotor. Permanent magnets are mounted on the rotor of a BLDC motor, and stator is wound with specific number of poles. This is the basic constructional difference between a brushless motor and a typical dc motor.

Stator windings of a BLDC motor are connected to a control circuit (an integrated switching circuit). The control circuit energizes proper winding at proper time, in a pattern which rotates around the stator. The rotor magnet tries to align with the energized electromagnet of the stator, and as soon as it aligns, the next electromagnet is energized. Thus the rotor keeps running.
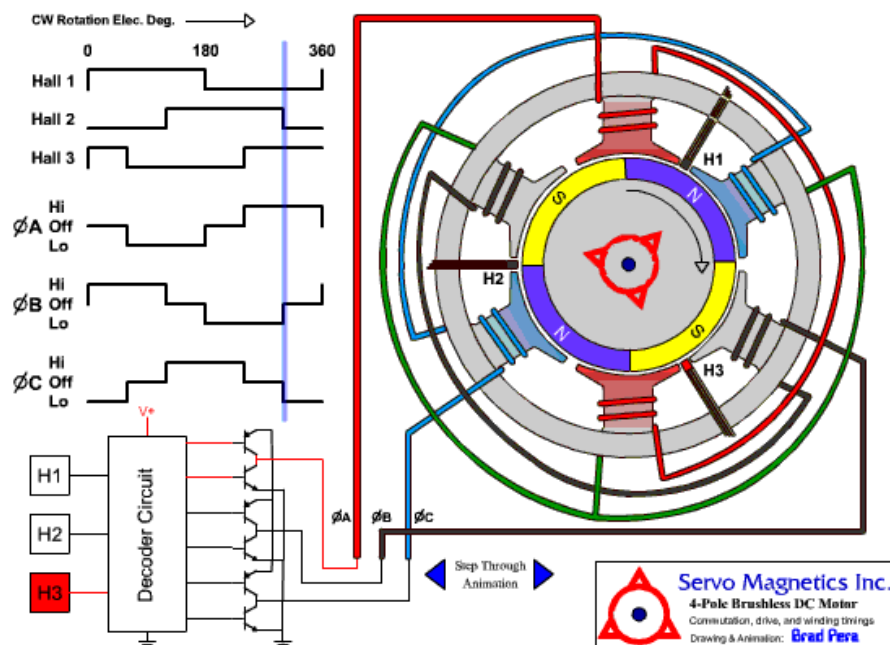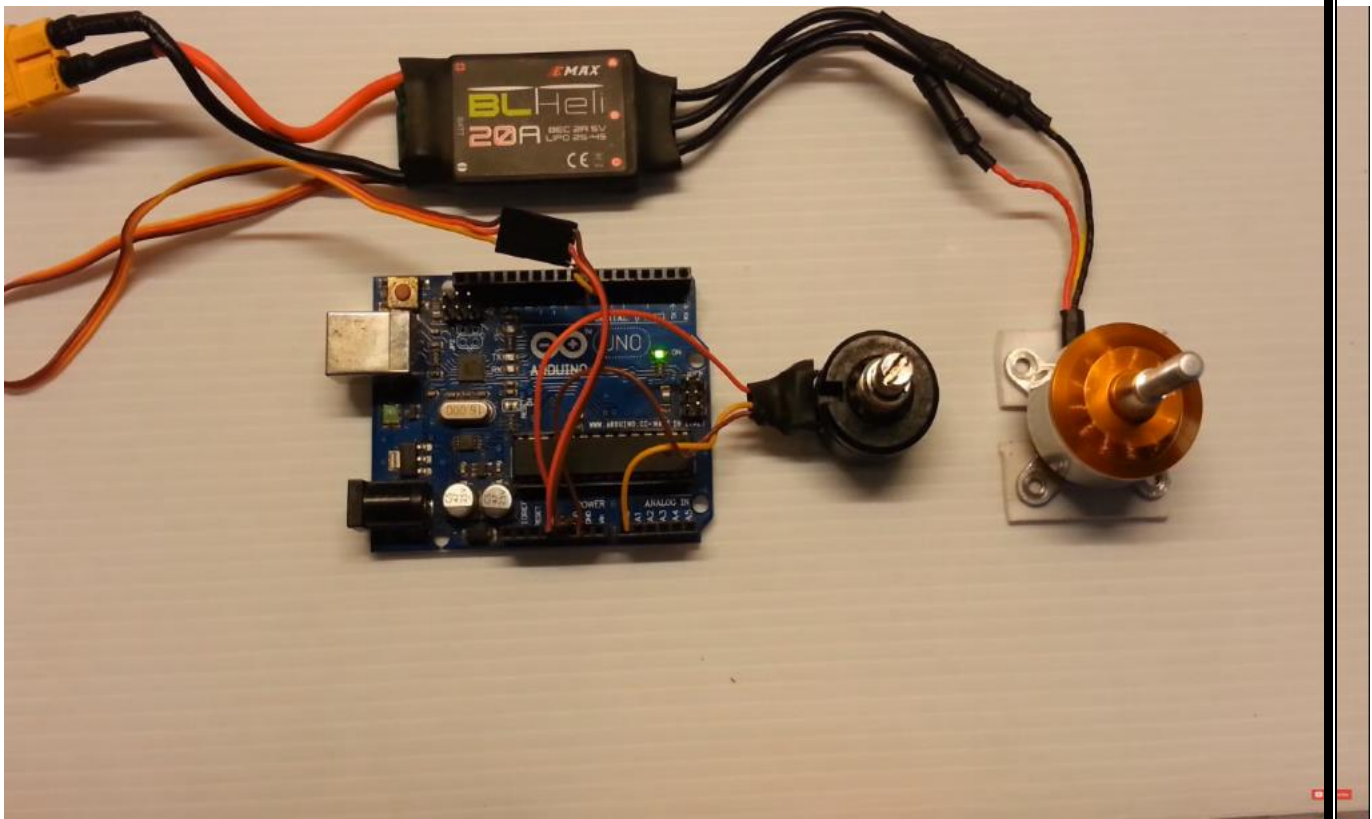
# CODE

```
#include <Servo.h>
Servo esc;
Void setup()
{
esc.attach(8);
esc.writeMicroseconds(1000);
Serial.begin(9600);
}
void loop()
{
int val;
val= analogRead(A0);
val= map(val, 0, 1023,1000,2000);
esc.writeMicroseconds(val);
}
```

# CHAPTER 5

# RESULTS



(This is the working shot of the project.As we cannot depict the working on the paper,a screenshot of that is provided).

# CONCLUSION

Now a days automation plays a very important role.ESCs are used to control the speed of the unmanned aerial vehicles(drone).Which can be used in various fields where man cannot access.

Drones are one of the rapid growing community in the modern era.Electronis speed controllers can be used to control the speed and flight of the drones.

# Chapter 7

# FUTURE WORK

1. Quadcopters

2. Airplanes

3. Helicopters

4. Electric Aircraft

## REFERENCE

https://youtu.be/DTOK6CgXRXg

https://www.cbinsights.com/research/drone-impact-society-uav/