



SPEED CONTROL OF BRUSHLESS DC MOTOR USING ARDUINO UNO R3

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Abstract

This project deals with speed control of bldc motor using arduino uno r3 with ESC (Electronic speed controller) and speed display on 16x2 display. Most of the electrical systems today required higher performance on efficiency and lower carbon dioxide consumption. Brushless DC (BLDC) motors can achieve these specifications because the high efficiency in comparison with traditional AC induction motor. The driving technique is trapezoidal pulse-width-modulation (PWM) wave which called trapezoidal control.

Index Terms: Arduino Uno board, Bldc, ESC

1. INTRODUCTION

Going back more than one hundred years, we find that the first automobiles have electric motor. Unfortunately, they did not maintain its position as the main power unit of automobile, because of that they wasn't at so high technical level to could compete with the rapidly developing internal combustion motor. Today the situation is different. With the coming of the electrical components we get to a level, where the electric motor can smoothly compete with other types of drives. Currently, an electric automobile, various hybrids and other devices, which serve to transport, use brushless DC motors. They are based on the principle of ordinary direct current motors. The greatest fault of DC motors was as mechanical commutator and this was eliminated in the brushless machines. They use the so-called inverse structure, in which the rotor is made of permanent magnets and winding is on the stator. In this way, they become maintenance-free DC machines, which started to be used in e-mobility. Recent development and research has proved that the future is with EV (Electric vehicle).

1.1 ARDUINO UNO BOARD

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, including

Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

1.2 BLDC

Brushless DC electric motor (BLDC motors, BL motors) also known as electronically commutated motors (ECMs, EC motors) are synchronous motors powered by DC electricity via an inverter/switching power supply which produces an AC/bi-directional electric current to drive each phase of the motor via a closed loop controller. The controller times commutation (hence rpm) and creates current waveforms (hence torque). In this context alternating current does not imply but does include a sinusoidal waveform, with minimal restriction on waveform; it must be periodic, and its frequency will determine motor rpm, and the waveform does effect how smooth the generated torque is as well as the motors efficiency at transforming electrical to mechanical energy. In a well-designed PMSM the air gap magnetic flux is spatial sinusoidal and the phase commutation currents are sinusoidal, ninety degrees out of phase. The motor structural elements of a brushless motor system is typically permanent magnet synchronous motor, but can also be a switched reluctance motor, or induction motor.

1.3 ESC

Regardless of the type used, an ESC interprets control information not as mechanical motion as would be the case of a servo, but rather in a way that varies the switching rate of a network of field effect transistors, or FETs.

2. SYSTEM ARCHITECTURE

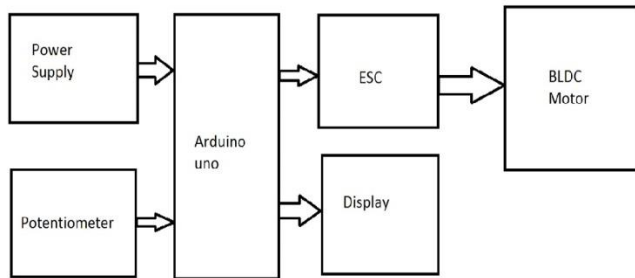


Fig-1: System Architecture

The Arduino Uno controller is used to control the ESC. The Arduino varies the speed as compared to the value of potentiometer, which is directly connected to the Arduino uno. The speed of the motor in percentage is shown on display. The language used to program Arduino uno is c and c++.

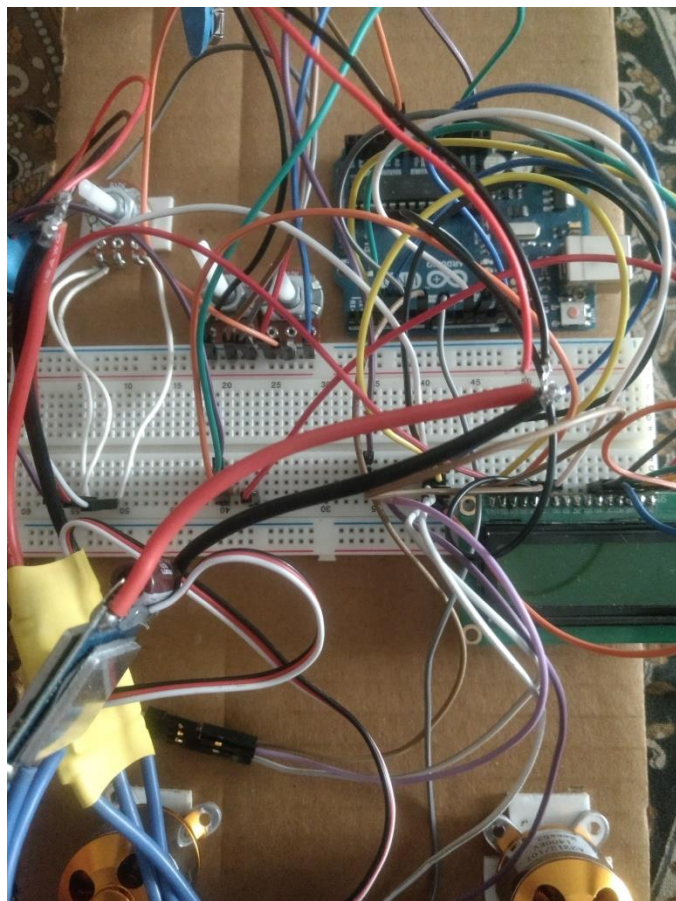


Fig-2: Actual Project

- BLDC motor
- Arduino Uno board
- ESC
- LCD 16x 2 Display
- Potentiometer
- Power Supply

3. RESULTS

We used Arduino to successfully vary the speed of brushless Dc motor which is displayed on LCD 16x2 Display.

4. CONCLUSION

This paper presents the speed control method of BLDC Motor using Arduino Uno board and ESC. The Arduino controller proves the capability to modulate the speed with ESC and Potentiometer as input. As the results of experiments, speed response and performance evaluation has been verified with different speed and external disturbances.

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