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Monitoring and Controlling of BLDC motor using IOT

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Abstract : Brushless Direct Current motors are synchronous motors which operates on DC current. These motors have various advantages over Brushed DC motors such as low cost, high speed torque characteristics, noise less operation. Speed controlling is Very important. Speed of the motor is controlled by (ESC) electronic speed controlled. The parameters like Speed, Current, Power, Temperature and Voltage are Monitored on from remote access through the configured electronic gadgets by using the Internet Of things. the purpose of this project is to control and monitor the of Brushless DC (BLDC) motor by using IOT. The Internet of Things (IOT) has led to huge development in digital world. IOT is interface that helps communication between objects Brushless DC Motor (BLDCM) has various features like high efficiency, reliability, high weight to torque ratio. Hence these motors have major significances in the industries. By utilizing this IOT, controlling and monitoring of a system is done to obtain desired output.

Keywords - Arduino, BLDC motor, Controlling and Monitoring, Electronic speed controller, IOT

I. INTRODUCTION

The Internet of Things technology that feature an Internet Protocol (IP) address for internet connectivity and communication between these devices and other internet enabled devices and systems. IOT technology is growing rapidly due to various merits such as less time consumption to obtain real time data, reduction in human efforts, ease in controlling the system There are several methods are used for monitoring of parameters such as mathematical modelling, finite element method and optimization techniques but these methods are time consuming and need more human effort. Because of the newly introduced concept of internet of things (IOT) is providing easy way to achieve the industrial automation through remote access and also to monitor the parameters. In IOT each device constituting a system will be able to communicate with the other devices or system in the same premises over a common platform. The IOT helps to control the system via various devices like smartphones, sensors, relays, etc. Sensors senses the condition of a system, this real time data is appeared on the smartphones because of IOT. IOT will provide connectivity of device, system and offers that machine-to-machine communication and covers a variety of protocols, domains, and applications. IOT along with the sensors, relays, control drives become the advance intelligence system which can be access from remote area.

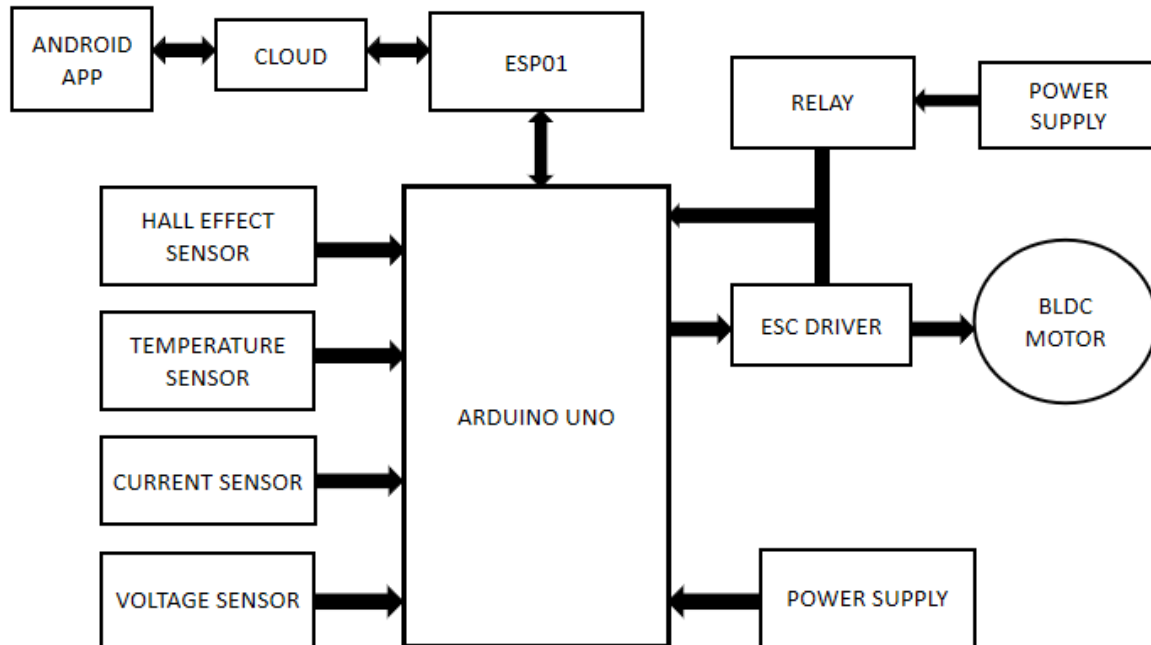


Figure 1: Block Diagram

II. LITERATURE SURVEY

BLDC motor are similar to the synchronous motor but the difference in the BLDC motor and the synchronous motor is that it produces the back EMF. BLDC motor is efficient and it has also high starting torque and it will also create less electrical noise while working. In the past years BLDC Motors are widely utilized in the industrial area as well as medical section. The number of techniques is used to controlling the BLDC motor. In this paper we are going to control BLDC Motor by using ESC technique and the Arduino. In this method we control parameters such as voltage, current, speed, etc. various sensors are used for sensing the parameters like temperature, voltage, speed, current, etc. In this paper the speed of the BLDC Motor is controlled by ESC technique. ESC is basically electronic speed controller which flows the speed reference signal by adjusting the duty cycle or the switching frequency of the transistor. The motor can achieve its required speed by varying the voltage of armature.

III. DESIGN METHODOLOGY

3.1 Working of The System

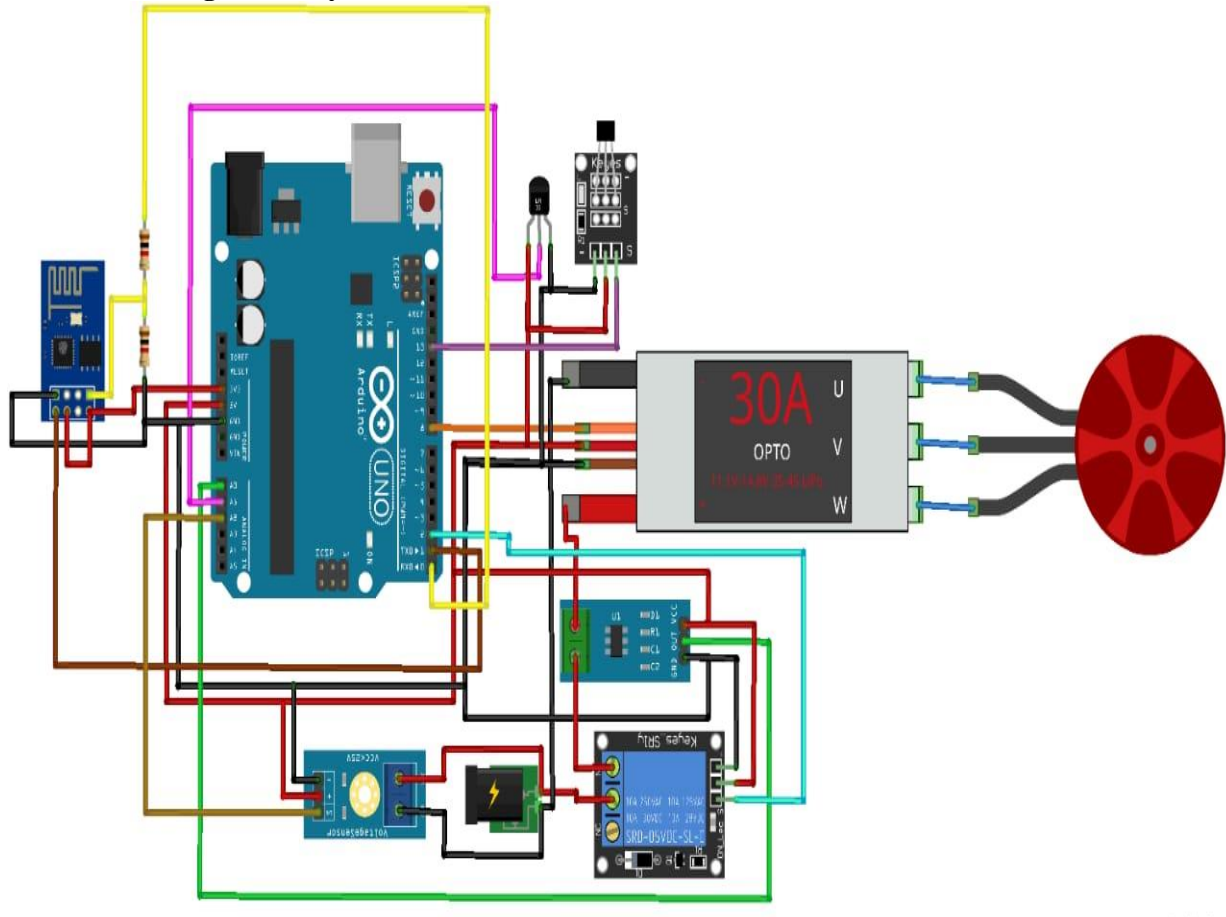


Figure 2: Circuit Diagram

The sensors connected in circuit are used to sense various motor parameters such as Current, Voltage, Temperature and Speed of the motor. Hall Sensor is used to measure the RPM or speed of the motor. LM35 Temperature sensor will be used to monitor temperature of the BLDC Motor. ACS712 Current Sensor is used to monitor current through the device, while Voltage Sensor is used to monitor the voltage across the device. this measured data is stored in thing speak cloud server. This project uses Atmega328P as the microcontroller. along with Atmega328P. An ESP8266-01 chip is used to add Wi-Fi capabilities. The BLDC Motor used in the system is a 1000 KV motor, which means for every volt it provides 1000 RPM speed. The speed of the BLDC Motor is controlled using PWM Signals and switching on/off of the BLDC Motor can be done remotely using Relays that activate/deactivate on signal from Mobile Phone. An ESC is used to drive the BLDC Motor. ESC used in the system is a 30 Amp Electronic Speed Controller. If a user gives a command of varying the speed through the mobile phone, that command is given to ESC driver via cloud server and Arduino. ESC driver will change the duty cycle accordingly to obtain a desired output.

3.2 Mathematical Modelling:

INPUT VARIABLES:

PWM value: pulse with modulation value

Rstate: Relay state

OUTPUT VARIABLES:

Current: current of BLDC motor

Volt: voltage of BLDC motor

Temperature: temperature of BLDC motor

RPM: speed of BLDC motor

ALGORITHM:

Rstate =1 then motor = on

Rstate=0 then motor = off

$0 < \text{PWM value} \leq 1023$

$\text{PWM value} = \text{rpm of motor}$

BLDC motor rating =1000 kv

Current $\leq 30\text{A}$

Voltage $\leq 25\text{V}$

Power = current *voltage

$55^{\circ}\text{C} < \text{temp} < 150^{\circ}\text{C}$

RPM CALCULATION:

$\text{RPM} = \text{no. of times blades sensed} / n$

Where, n = no. of blades on propeller

IV. RESULT AND DISCUSSION

In this paper the back emf can be detected by sensor less mode with IOT based control. In this project, the monitor and control of BLDC motor parameters by using IOT. In this method, the speed control can be achieved by online mode with WI-FI control. For this control purpose Arduino Uno WI-FI, board is used. Whenever the speed control is required, this is able to control the speed anywhere in the place. After control of speed, we can able to turn off the WIFI. There are various sensors are used for parameters monitoring such as temperature sensor, voltage sensor, current sensor and the hall sensor is also used to detect the speed of the rotor. The speed is adjusted to desired value and the corresponding parameters are monitor through IOT automation technique. IOT gives an easy access to control and sense various parameter OD the system, which exist far away. This will help in improving efficiency, accuracy and reduce the human efforts.

V. CONCLUSION

BLDC motors offer a many advantages over conventional brushed motors. The removal of brushes from a motor eliminates a mechanical part which used to cause reduces efficiency, wears out, or can fail catastrophically. The powerful rare Earth magnets helps the BLDC motor to produce same amount of power has brushed DC motor also it fits into smaller space. The only demerit of BLDC motor is unlike brushed DC motor it requires an electronic system to supervise the energizing sequence of the coil. Without electronic circuit motor cannot operate. Since BLDC motor has commendable properties like inexpensive, robust, less noisy, simple in construction, etc., these Motors are widely used in industries nowadays. The brushless DC (BLDC) motor is changing into more and more widespread in sectors like automotive (particularly electrical vehicles EV).

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