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IOT BASED SMART WIRELESS SYSTEM FOR SPEED AND DIRECTION CONTROL OF BLDC MOTOR

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Abstract: IoT (Internet of Things) based smart system to control, measure, and monitor the bidirectional speed control through remotely. The motors are turned ON and OFF by a specific relay operation. To achieve the desired motor speed, the stator voltage control method has been applied by using Pulse Width Modulation (PWM) technique. For reversing the motor direction of rotation, the stator magnetic field is reversed by swapping the contacts of auxiliary winding by relay operation. Whenever the desired value is submitted for a specific operation from a specially designed website, the desired control signal is generated from a programmed microcontroller according to the user's command via a webserver using GSM communication. Motor status data is measured using an IR sensor and observed remotely on the monitoring panel integrated with a web application. The IoT-based smart motor control system can be used in this modern age to continuously track, control, and monitor machines, goods, plants, etc. for versatility in multi-purpose applications.

Keywords: IoT(Internet of things), DC motors, LCD display, IR sensors, icro controller.

I. Introduction

Nowadays BLDC motor is using in a wide range of applications like industries, ceiling fans, washing machines, compressors etc. The android is one of the most useful thing in our day to day life. As the internet has become widespread today, remote accessing, monitoring, and controlling of systems are possible using IOT. In this project we can control the speed and direction of the BLDC motor using android with a Wi-Fi module. The speed control technique used in our project is PWM technique. The micro controller used in this project is raspberry-pi which is used to control electronic components for physical computing and explore the Internet of Things.The parameters of the prototype design are observed in LCD by a microcontroller and shared to remote computer/mobile using IoT through wifi which makes the system flexible and user friendly. This is project is useful and we can easily control the speed and direction of the motor from any place.

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Figure 1 Model design of smart wireless system

It mainly consists of a web application developed on a remote computer or smartphone, a GSM/GPRS module for interfacing with the server system, a Microcontroller, an LCD, IGBTs with gate drive circuits, Bridge rectifiers, IR sensors, a relay module.

II. Architecture of the BLDC system

The block diagram of a BLDC motor control system is shown in Figure 1. The four main parts of the BLDC control system are the power converter, controller, sensors and motor. The sensor is used to determine the rotor position, and it sends this information to the controller.

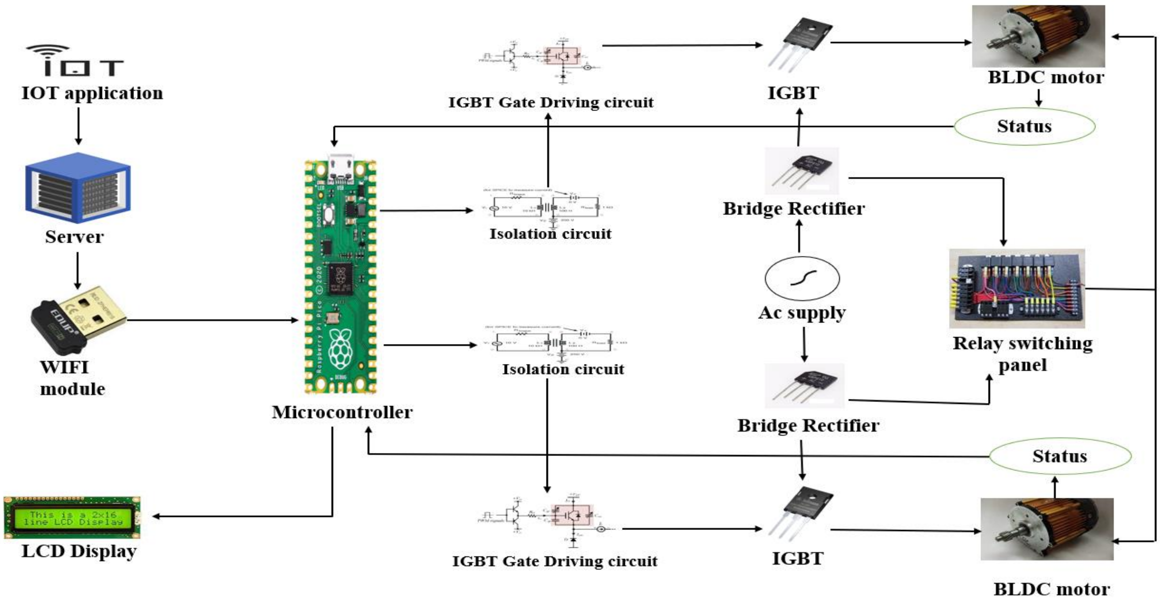

Figure 1 Block diagram of IoT based bidirectional speed control and monitoring

The controller requires feedback information about the rotor position so it can generate a pulse width modulation (PWM) duty cycle to power the phases of the semiconductor bridge. The controller uses a PWM modulator to generate signals which drive the power converter.

The speed of a BLDC is directly proportional to the voltage, and the applied voltage is increased or decreased accordingly. In a PWM controller, the PWM duty cycle controls the voltage . As voltage is applied, a current flow through the windings of the motor and this current provides torque to spin the motor. The motor can spin either in clockwise or counterclockwise direction by applying positive or negative voltage.

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The IoT based bidirectional speed and status observation of the motors is accomplished by the web application. The GSM/GPRS module acts as an interface between the web server and the microcontroller unit to send and receive command and output signals. Following the specific command input from the field operator, the programmed microcontroller generates PWM signals. These signals are sent through the isolation circuit to the IGBT gate driver circuits to operate the IGBT switches. By the PWM AC chopping technique, input AC voltages to the stator windings of the induction motors are varied. As a result, the motor speeds are controlled. The IR sensors are used for measuring the RPM of the motors and the results are compared with fine-tuned digital tachometer readings. The relay module with four sets of relays is employed for the motor on/off and direction control. The overall motor status is observed in the LCD and the web application developed in the remote computer or smartphone.

III. Speed Measurement and Motor Status Monitoring

The Measurement of the speed of induction motors is done by IR sensor, disc, and microcontroller as shown in Fig. 3. IR sensor emits infrared rays through the discs or blades of the motors and the receiver of the sensor experiences high voltage peaks when an obstacle or blade cuts the rays. By counting the number of peaks, the speed of rotation in rpm is determined using the programmed microcontroller. The rpm values are sent to the LCD unit and the web application in a remote computer via the GSM/GPRS module. The rpm values obtained from the IR sensor are verified with a fine-tuned digital tachometer

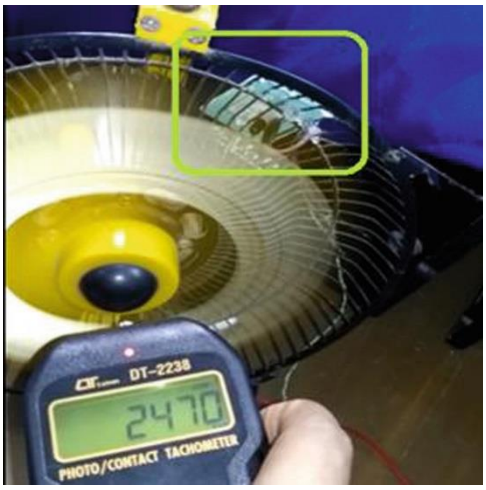

Fig 2-3 Measurement of the speed of BLDC using a digital tachometer

IV. CONCLUSION

In this paper, Multiple BLDC motors of speed and direction control and monitoring using IoT technology. The speed control of the BLDC motors has been performed by the stator voltage control method using the PWM technique. The ON/OFF and the bidirectional rotation of the motors have been controlled by the cheap and simple operation of relays. The motor operational parameters have been monitored remotely in a computer or smartphone

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using IoT through Wifi. It is also possible to develop an android based application to make the system more user-friendly.

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