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IOT Based Motor Speed Control and Temperature Measurement

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ABSTRACT: This project is mainly comprised of controlling equipments wirelessly. IOT based motor speed control and temperature measurement is basically a VFD circuit with temperature measurement circuit which can be controlled through mobile or through website on internet. For IOT, BLYNK APP and ESP8266 Wifi module with Arduino UNO is used. They controls Inverter circuit and sends feedback data to the controller. From this technique soft starting of motor can also be obtained. It is comprised of hardware and software. The frequency generation of VFD circuit is controlled by IOT devices through BLYNK APP. IOT devices are programmed using Arduijno IDE software. BLYNK APP controls Wfi module. Wifi module controls Arduino. Arduino gives PWM signal to optocoupler circuit. Optocoupler circuit is used for isolation between High voltage side devices and low voltage side devices. Optocoupler circuit gives output to gate driver circuit. Now gate driver circuit controls gate terminals of IGBT's of inverter. This is how frequency of inverter is controlled. For temperature measurement ESP8266 Wifi module is used and one temperature sensor is used. It senses the temperature and gives feedback to Wifi module. Wifi module gives data to BLYNK APP.

KEYWORDS: Arduino, Blynk App, Esp8266, PWM

I. INTRODUCTION

General purpose of motors are increasing widely in our surrounding from household equipments to machine tools in industrial applications. It is a necessary and indispensable source of power in many industries. In many applications the speed control plays a vital role which can be done using many control strategies. The purpose speed controller of a motor is to take signal representing the demanded speed and to drive a motor at that speed. Generally speed control of the motor can be done by varying the motor parameters of the induction motor such as current, voltage, frequency etc. this can be achieved by different methods such as field control method, armature control method etc.

In this project speed control is done by PWM (Pulse Width Modulation) technique and the parameters are monitored and displayed in LCD by and shared to mobile using IOT through node MCU which makes the whole system flexible and user friendly. With the help of IOT through node MCU the required speed is given as input to PWM through Arduino UNO thus varying the speed of induction motor. Present industry is increasingly shifting towards automation. Two principle components of today's industrial automations are programmable controllers. today there is a general tendency to develop an intelligent operation.

The objective of this project is to monitor and control, the speed of motor and also monitor temperature, and protect if the induction motor parameters such as voltage, current, temperature and speed are exceed above the normal value without using any sensor.

II. DESIGN METHODOLOGY

Methodology

The circuit of project is divided into mainly five sections there is nodeMCU, arduino UNO, gate driver circuit, opto-coupler circuit and three phase inverter. i.e There is the input stage that is composed of nodeMCU and

Arduino, a program ins embedded into arduinthroughArduino IDE software and the driving circuit is connected lastly to the inverter that will be connected to three phase motor. The input stage has five sections that are so arranged to form a circuit. A program loaded into Arduino UNO from the embedded software. The five stages are designed independently before being joined into one system.

A. Block diagram

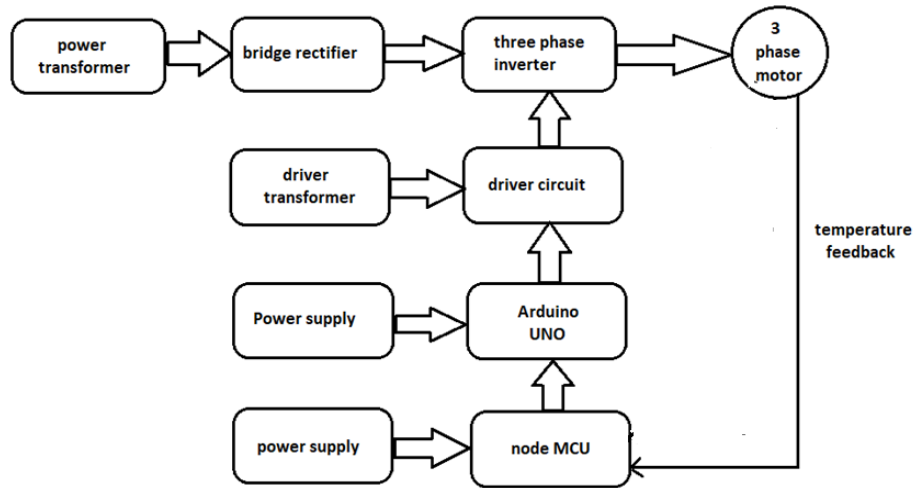


Fig 1. Block diagram of IOT based motor speed control and temp measurement.

The block diagram of IOT based motor speed control and temperature measurement is shown in fig. 2.1. it consists of power supply, node MCU, speed sensor, temperature sensor, arduino, driver circuit, three phase inverter, bridge rectifier, and three phase induction motor. Connected to each other as per block diagram three phase motor is driven by a three phase inverter which is powered by power transformer through rectifier. The firing pulse to gate of inverter is given by gate circuit. Driver transformer powers gate driver circuit. The Gate Driver Circuit is controlled by Arduino UNO. Arduino UNO is programmed for six pulse generation for gate driver circuit of Inverter.

For controlling Arduino wirelessly NODE MCU is connected to Arduino. Through NODE MCU ,Arduino can get signals wirelessly. For Temperature measurement analogue pin of NODE MCU is used. Temperature feedback and speed feedback is given from motor to NODE MCU.

III. CIRCUIT DIAGRAM

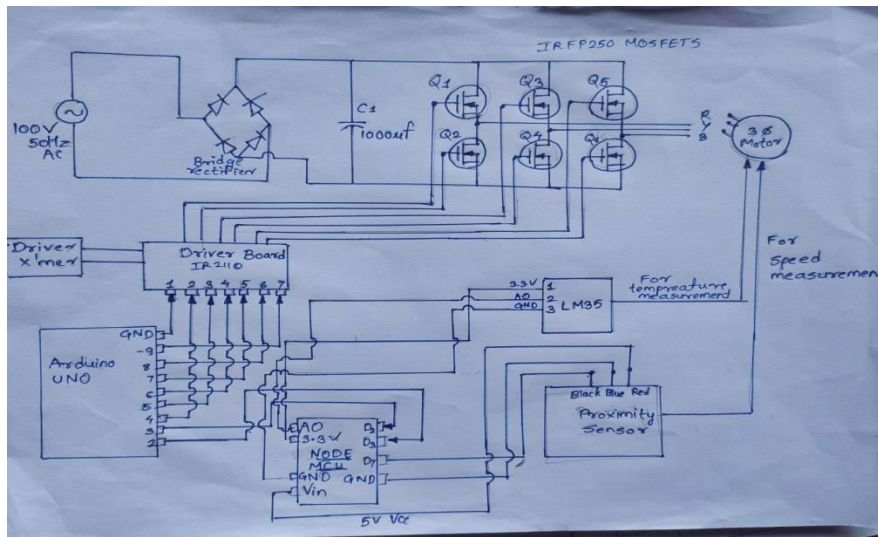


Fig.2 Circuit diagram of IOT based motor speed control and temp measurement

Connection is done as per circuit diagram. Two controllers are used Arduino Uno and Node MCU. Arduino is used for six pulse generation for gate driver circuit and Node MCU is used for IOT and speed measurement. Driver board is used to provide gate pulse for inverter MOSFET'S. The input for inverter will come as single phase AC by 1 phase transformer and then converted into DC by rectifier and this DC supply is converted into AC by 3 phase inverter. The gate terminal of MOSFET'S are controlled by gate driver circuit. This AC signal is fed to 3 phase AC motor. For speed measurement proximity sensor is placed on the shaft of the motor. Proximity sensor gives signal to node MCU. Node MCU is connected to Arduino. Arduino and Node MCU are programmed using their codes. We can vary speed of motor through a application for node MCU through internet. LM35 temperature sensor provides temperature data of motor to NODE MCU.

IV. WORKING PRINCIPLE

The inverter is working on the principle of 120 degree conduction mode. So at one instance one two IGBT's will conduct. For that Gate firing pulse is required. It is provided by Gate driver circuit. The gate driver circuits are used. One circuit controls two IGBT's. For Six IGBT's three circuits are required. This project has chain of controlling devices. Blynk app controls wifi module. Wifi module gives signal to Arduino to produce PWM pulses . These pulses are fed to Optocoupler Circuit. Optocoupler circuit controls Gate driver circuit and Gate driver circuit controls Inverter. For temperature measurement sensor provides data direct to Wifi module and temperature is displayed on Blynk app.

V. DEMO PROJECT MODEL

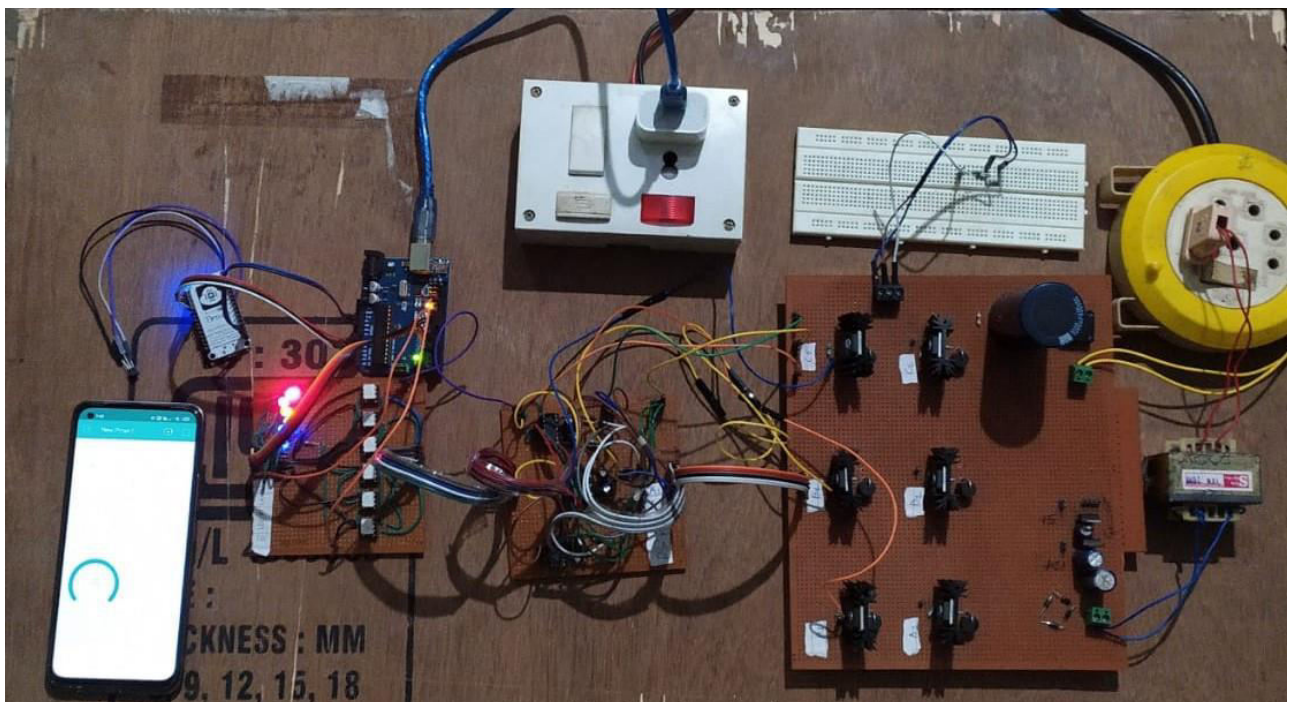


Fig.3 Demo Project Model

VI. RESULTS

Hence speed of motor is controlled as frequency can be changed and temperature measurement became easy. Also turn ON and turn OFF of motor supply becomes easy. As shown in fig.5 Blynk app is providing signals to Wifi module to produce PWM signals by Arduino. So the Led's in Fig.5 are used to observe PWM frequency. These Led's change blinking frequency when input frequency is changed.

In Fig.4 It is shown that output fo inverter is available. In place of motor, three star connected resistors are used and the inverter circuit is checked on low voltage.

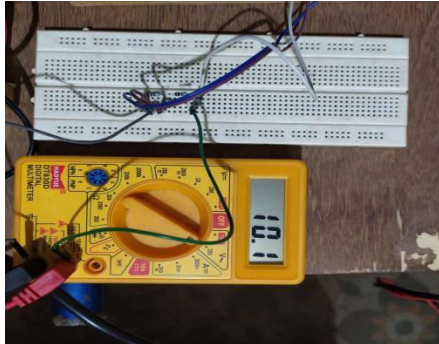


Fig. 4. Output voltage



Fig. 5. IOT (controlling circuit)

VII. FUTURE SCOPE

The Present industries are increasingly shifting towards automation. Two principle components of today's industrial automations are programmable controllers. IOT platform is easy, safe and very good it has higher accuracy, easy control system in future the whole world is going towards the digitalization. So this project is very useful in future. We can implement many things in future, like various fault detection programs and many more things and its also reduce human power.

VIII. CONCLUSION

The progress in science and technology is a nonstop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place. The proposed system based on IOT is found to be more compact, user friendly and less complex, which can readily be used in order to perform. Several tedious and repetitive task. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial and research applications. Due to the probability of high technology used this "IOT BASED MOTOR SPEED CONTROL AND TEMPERATURE MEASUREMENT" is software controlled with less hardware circuit. The feature makes this system is the base for future systems. The principle of the development if science is that "nothing is impossible". So we all look forward to a bright and sophisticated world.

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