

IOT Based Speed And Direction Controller For Single Phase Induction Motor

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Abstract: This paper deals with the control the external operation of the electrical appliances connected to this system from far away from the operator. For this purpose user can use Wi-Fi module. Using the IOT, can switch and fault detection of the electrical devices. This is used for agricultural, industrial, domestic, commercial application. In the load side the load should be either single phase or three phase. From this paper, the single phase induction motor is controlled by using ARDUINO UNO. In this project, we are monitoring and controlling the speed of induction motor as well as direction of the motor.

Keywords: Induction Motor, Arduino Uno, ESP8266 IOT Module.

OBJECTIVES

The main objective of this paper is to maintain the speed of the single phase induction motor can be controlled easily. It reduces the harmonic content of motor current and increase the motor efficiency. The speed control of the motor can be achieved by varying the input parameter of the Motor such as current or voltage.

INTRODUCTION

The aim of this project is to control the speed of an induction motors, the electrical or electronic appliances connected to this system from anywhere in the world. For this user can use any type of Mobile. By this way it overcomes the limited range of infrared and radio remote controls... Our project deals with reduction of manual operation by combining various technologies such as electric drives, wireless communication and embedded technology. The speed of the induction motor is varied in a narrow range by varying the voltage applied to the stator winding. This type of speed control is applicable for certain applications, where the load varies approximately as

the square of speed, such as centrifugal pump drives, fan load. This project deals with IOT to control the speed and direction of the induction motor.

TYPES OF INDUCTION MOTORS

Generally, induction motors are categorized based on the number of stator windings. They are:

Single-phase induction motor

Three-phase induction motor

Single-Phase Induction Motor: There are probably more single-phase AC induction motors in use today than the total of all the other types put together. It is logical that the least expensive, lowest maintenance type motor should be used most often. The single-phase AC induction motor best fits this description. As the name suggests, this type of motor has only one stator winding (main winding) and operates with a single-phase power supply. In all single-phase induction motors, the rotor is the squirrel cage type.

Three-Phase AC Induction Motor: Three-phase AC induction motors are widely used in industrial and commercial applications. They are classified either as squirrel cage or wound-rotor motors. These motors are self-starting and use no capacitor, start winding, centrifugal switch or other starting device. They produce medium to high degrees of starting torque. The power capabilities and efficiency in these motors range from medium to high compared to their single-phase counterparts. Popular applications include grinders, lathes, drill presses, pumps, compressors, conveyors, also printing equipment, farm equipment, electronic cooling and other mechanical duty applications.

HARDWARE IMPLEMENTATION

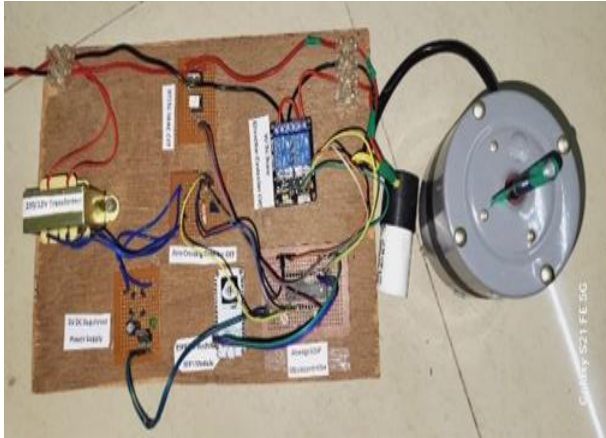


Figure 1: Real Image of the Project

SOFTWARE REQUIREMENTS

Arduino IDE

The Arduino Integrated Development Environment (IDE) is the main text editing program used for Arduino programming. It is where you'll be typing up your code before uploading it to the board you want to program. Arduino code is referred to as sketches.



Figure 2: Arduino IDE

Blynk IoT: Android/Web App

Blynk is an IoT (Internet of Things) stage utilizing which you can without much of a stretch and distantly control equipment. Furthermore, you can likewise see sensor information, store the information, picture the information and so on everywhere.



Figure 3: Blynk IOT app

Arduino Libraries

ESP8266

The Wi-Fi library for ESP8266 has been developed based on ESP8266 SDK, using the naming conventions and overall functionality philosophy of the Arduino Wi-Fi library. Over time, the wealth of Wi-Fi features ported from ESP8266 SDK to esp8266 / Arduino outgrew Arduino Wi-Fi library and it became apparent that we would need to provide separate documentation on what is new and extra.

ATmega328P Microcontroller

The Arduino Uno has microcontroller board which is based on the ATmega328 datasheet. It has 14 digital input/output pins of which 6 can be used for PWM outputs, 6 for analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything which is needed to support the microcontroller, simply connect it to a computer with a USB cable and power it with an AC-to-DC adapter.

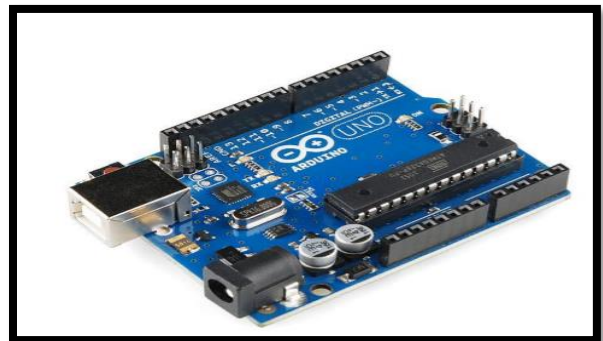


Figure 4: Arduino Uno

Node MCU ESP8266 module

Node MCU is a low-cost open source IoT platform. its hardware design is open for edit/modify/build. Node MCU Dev Kit/board consist of ESP8266 wifi enabled chip. The **ESP8266** is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer to the ESP8266 WiFi Module.



Figure 5:Node MCU

Single Phase Induction Motor

A capacitor start/run single phase induction motor has been used as shown below



Fig 6 Induction Motor

5V DC Relay

Relay is sensing device which senses the default in the circuit and sends a trip signal to circuit breaker to isolate and work on the faulty section. A relay is an automatic device in which electrical circuit is indirectly controlled and is governed by changes in the same or another electrical circuit.



Fig 7: 5V DC Relay

Transformer

Transformer is static device which transfer electrical energy from one circuit to another circuit with change in voltage or current without change in frequency .in this step-down transformer is used.

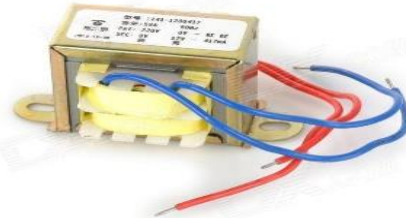


Fig 8 230/9V Transformer

Voltage Regulator

A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level. In this project, power supply of 5V and 12V are required. The L78xx series of three terminal positive regulators is available.



Fig 9:7805 Voltage regulator IC

TRIAC (BT136)

The BT136 is TRIAC with 4A maximum terminal current. The gate threshold voltage of the BT136 is also very less so can be driven by digital circuits. Since TRIACs are bi-directional switching devices, they are commonly used for switching AC applications.

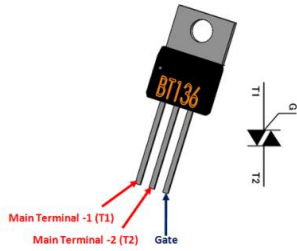


Fig10:- BT136 TRIAC

MOC 3021 Opto Isolator

The MOC3021 IC is a non-zero crossing, 6-pin Optocoupler composed of a gallium arsenide infrared emitting diode as input and a light-activated silicon bilateral switch called a TRIAC as output.



Fig 11: MOC 3021 OptoIsolator

4n25 OptoIsolator

The 4N25 is an industry standard single channel Phototransistor Coupler with base connection. The optocoupler consists of gallium arsenide infrared LED and a silicon NPN phototransistor. The 4N25 is an optocoupler for general purpose applications.

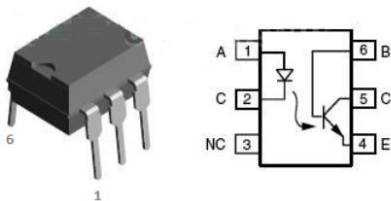


Fig 12: 4n25 OptoIsolator

Power Supply

Every electrical and electronic device that we use in our daily working life will require a power supply. In general, we use an AC supply of 230V 50Hz, but this power has to be changed into the required form with required values or voltage range which will be used for providing power supply to different types of devices.

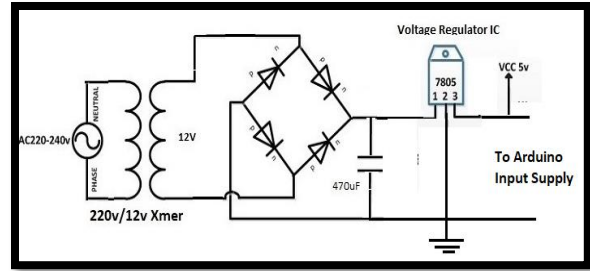


Fig 13 Circuit Diagram of Power Supply

CONCLUSION

Single phase power system is widely used in domestic purpose, commercial purpose and to some extent in industrial purpose. As the single phase system is more economical and the power requirement in most of the houses, shops, offices are small, which can be easily met by single phase system. The single phase Induction motors are simple in construction, cheap in cost, reliable and easy to repair and maintain.

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