



IOT Based Single Phase Induction Motor Smart Control Using Real Time Clock

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- **Abstract** - This project presents the overall design of 1 Phase induction motor System with low cost and wireless system. It specifically focuses on the development of an IOT based induction motor system that is able to control various components via internet or be automatically programmed to operate from ambient conditions. In this project, we design the development of a firmware for smart control which can successfully be automated minimizing human interaction to preserve the integrity within whole electrical devices in the home.
- We used Node MCU, a popular open source IOT platform, to execute the process of automation. Different components of the system will use different transmission mode that will be implemented to communicate the control of the devices by the user through Node MCU to the actual appliance.

INTRODUCTION: This project is used to control the speed of single-phase induction motor by using Node MCUcontroller. The single-phase inverter converts dc voltage into ac voltage. Single phase induction motor speed depends on the frequency of inverter. Induction motor is very useful to



perform the no. of operation in the domestic and industrial purpose. Induction motors are used for automation, appliances, induction control; because they are robust, reliable and durable but due to the subjected in undesirable stress, the efficiency of induction motor is lower or failure. Single phase induction motors are manufactured in fractional kilowatt range to be operated on single-phase supply. The project proposes an efficient implementation for IoT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web.

1.1 Motivation

The main motive of this innovation research paper is to detect the fault and protection of single-phase induction motor from over voltage, under voltage. Single phase induction motors are in very wide use in industry especially in fractional horse-power field. They are extensively used for electrical drive for low power constant speed apparatus such as machine tools, domestic apparatus and agricultural machinery in circumstances where a three-phase supply is not readily available.

1.2 Project Scope & Limitations

□ Project Scope

- In this project, there is provision of remotely observing the current, voltage, power factor and speed of the induction motor, switching on or off of the motor and changing the speed of the induction motor; all through the webpage. This project is microcontroller based and is easily controllable. It has wide range of applications when employed for monitoring required parameters and controlling speed of a single-phase induction motor in industrial sectors.

• Limitation

The bulk of the cycle is weather specific. It is a natural phenomenon that can become unpredictable given the modified technologies. Climate conditions such as rain, sunshine,



drought etc. are not influenced or regulated by any power. The value of nature occurrences cannot be reserved while the smart system is in place.

1.1 Methodology

- 1) Analysis of the problem. Analyze the problems to be studied regarding smart control induction motor.
- 2) Analysis of needs. In this case all needs in researching both from journals, literature books, tools, and materials.
- 3) System design. Designing tools to be built using the Node MCU ESP8266 module, and the sensors used.
- 4) System programming. Make a program using the Arduino IDE and the Blynk android application.
- 5) Testing tools. Testing tools with program codes created and internet connections.
Making reports and summarizing the results of the experiment. See system responsiveness to commands given to smart home

LITERATURE SURVEY: Smart Energy Efficient Induction Automation System using IOT”, by Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, Arun Kumar Mishra.

2.V.S.D Rekha, Dr. K.S Ravi

“Induction Motor Condition Monitoring and Controlling Based on IoT Monitoring, controlling and protection system for the single-phase induction motor was successfully designed and fabricated with success as per the aim of the project, but there is always room for improvement in any project to enhance the project.



3.1 Arduino IDE Window

```
int ledPin = 13; // LED connected to digital pin 13

// The setup() method runs once, when the sketch starts

void setup() {
  // Initialize the digital pin as an output:
  pinMode(ledPin, OUTPUT);
}

// the loop() method runs over and over again,
// as long as the Arduino has power

void loop()
{
  digitalWrite(ledPin, HIGH); // set the LED on
  delay(1000);                // wait for a second
  digitalWrite(ledPin, LOW); // set the LED off
  delay(1000);                // wait for a second
}
```

Specifications: -

Arduino Uno is a **microcontroller board based on the ATmega328P** (datasheet).

It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button.

4.1.1 PCB DESIGN

4.2.2.1 Introduction to PCB: -

Printed circuit boards may be covered in two topics; technology and design. Printed circuit boards are called PCB in short. Printed circuit consists of conductive circuit



pattern applied to one or both sides of an insulation base, depending upon that, it is called single side PCB or double-sided PCB (SSB and DSB). Conductor materials like silver, brass, aluminum and copper are most widely used. The thickness of the conducting material depends upon the current carrying capacity of circuit. Thus, a thicker copper layer will have more current carrying capacity.

The printed circuit board usually serves three distinct functions:

1. It provides mechanical support for the components mounted on it.
2. It provides necessary electrical interconnections.
3. It acts as a heat sink that is it provides a conduction path leading to removal of most of the heat generated in the circuit.

Steps for preparation of PCB

□ PCB designing and component fabrication: -

A printed circuit board is popularly known as PCB. It is a piece of fiber sheet on which one side complete layout diagram of an electronic circuit consisting of copper silver printed by using proper technique & other side of PCB, electronic component are mounted. In this project, hardware required is fabricated over glass, epoxy copper clad.

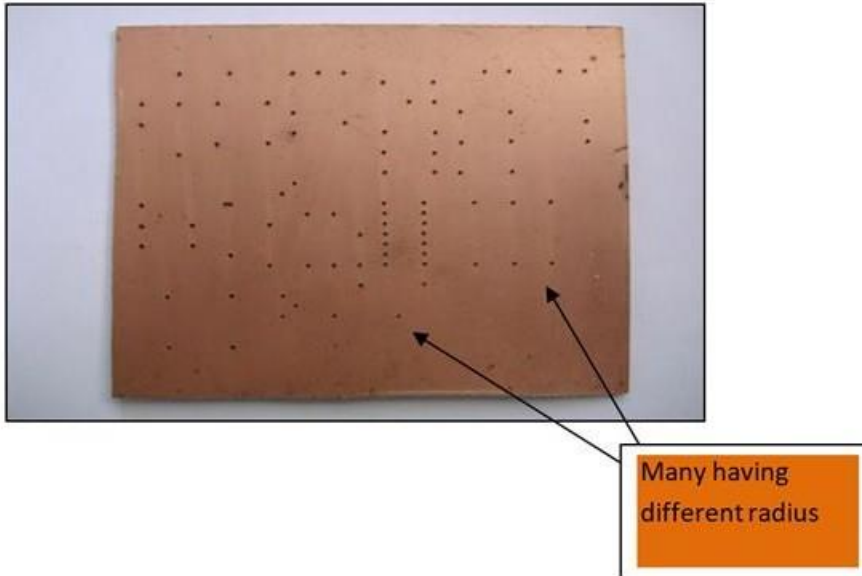
□ PCB painting: -

The PCB painting is done with oil paint with the help of sharp pointed brush.

□ PCB drafting: -

Most important step in PCB art work is preliminary sketching. Board is sketched out by pencil, carbon paper & trace paper. In this process first copper clad is cleaned to remove oxide layer by using sand paper. Then place the carbon paper about it & trace the tracks with pencil to get the image of layout paper on copper clad.

PCB DRILLING:



4.1.1 Designing of PCB

In almost all electronic circuits a number of components are used. It is impossible to wire each and every component, so a more convenient technique is used to avoid the lengthy process.

It is the use of printed circuit board. The actual electronic circuit is limited to the imagination of the person designing the board. The name printed circuit board arises because the electronic circuit appears to be printed on the base material.

A printed circuit actually consists of this layer of copper foil. The final circuit is shaped by etching the copper in FeCl_3 . The copper foil acts as a wire or conductor in the circuit. Component parts like resistor, transistor, capacitor and IC are soldered to the conductive foil to complete the electric path and circuit.



- **Manufacturing process of printed circuit board:**

The conductor pattern which is on the master film is transferred on copper clad laminate by two methods:

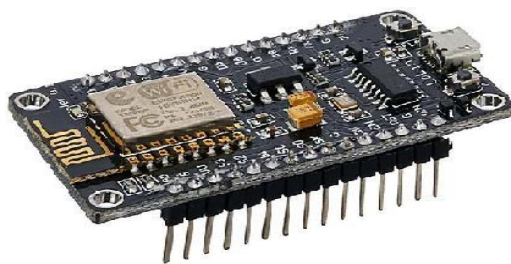
1. Photo resist printing.
2. Screen printing.

Advantages of PCB: -

1. Good moisture resistance
2. Good electric properties
3. No effect of weak acid
4. Slight effect of strong acid
5. Slight effect of organic solvent
6. Provides mechanical support
7. Occupies less space
8. Good electrical property

NODE MCU:

The node MCU with cp2102 Wi-Fi Board is an all-in-one microcontroller + Wi-Fi platform that is very easy to use to create projects with Wi-Fi and IoT (Internet of Things) applications. The board is based on the highly popular ESP8266 Wi-Fi Module chip with the ESP-12 SMD footprint. This Wi-Fi development board already embeds in its board all the necessary components for the ESP8266 (ESP-12E) to program and upload code.





a) LCD 16X2

It can be configured to drive a dot-matrix liquid crystal display under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver.



CONCLUSION

The speed control of single-phase induction motor by using Node MCU controller. The PWM pulses are generated by using Node MCU controller. The single-phase inverter frequency is varied by using increment and decrement switches. The single-phase inverter output. The project only considers single phase induction motors but in reality, other electrical equipment can also be controlled and monitored using the same system. The wireless system in this project requires the remote monitor to be specifically connected to the Wi-Fi module i.e., it has a limited range but for future works using internet the range can be improved.



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- **Future Scope**

In the future lot of scope is there for IoT applications. Worldwide wide all overuse the IoT application for human life sophisticated. In 2025 millions of things connect to the cloud. A lot of research also done on IoT and it's more uses for human life's easiest purpose. Some research works on defense services for security and surveillance, some on automatic vehicle control and traffic signal control, some on the medical field for body control and health care, some on electronic devices, smart home, etc.

- **Applications**

- Industrial applications
- Pumping system

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