Control of Three Phase Induction Motor by Ardiuno with IoT

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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 android type of mobile. Using the IoT, can switch and fault detection of the electrical devices. This is used for agricultural, industrial, domestic, commercial application. The circuit diagram consist of GSM module and Wi-Fi modules are connected to microcontroller. At the load side the load should be either 1-phase or 3-phase. From this paper, the three phase induction motor is controlled by using microcontroller (arduino UNO). In this proposed system, we are monitoring and controlling the speed of induction motor as well as direction of the motor. This system consists of microcontroller, Temperature sensor, induction motor and WI-FI module. The temperature sensor which measures the temperature of the Induction motor. The main objective of this paper is to maintain the speed of the three 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, voltage.

Key words: Ardiuno, IoT, Three Phase Induction Motor

I. INTRODUCTION

The Internet of Things (IOT) is a network of physical objects are embedded with devices, sensor, network connectivity are provided with unique identifiers and the ability to automatically collect and transfer data over a network without requiring human-to-human or human-to-computer interaction. IOT has evolved from the convergence of wireless technologies, micro-electromechanical systems and the Internet. The internet of things also called an Internet of objects. Online monitoring system for continuous casting equipment is established based on IOT sensing technology and communication technology. The parameters such as voltage, current, speed and torque of induction motor were monitored.

The monitored values are displayed in LCD and also sent to the server using Internet of Things (IOT) technology. If overload condition occurs, relay driver circuit will open and makes the motor to turn OFF. Thus input values are maintained within the limit and speed of the motor will be in a controlled manner. Internet of Things (IOT) is providing a helping hand to achieve the Industrial automation through remote access. The Internet of Things in automation will increase operational efficiency, lower costs, and improve productivity.

The various control methods are: Field control method, Armature control method, Ward-Leonard method.
The advantages of the IOT are highly automated, Improves efficiency, reduce the manual work, Can be operated from various place, Easy to access.

II. EXISTING SYSTEM

The Existing system uses BTLE for sharing the data between main control unit and of sub units which can be more than one units.

A. System Hardware

1) PIC 16F877A – 8bit microcontroller.
2) BTLE – RF transceiver.
3) ESP8266–Wi-Fi Transceiver.
4) Temperature Sensor.
5) IR Based Speed sensor.
6) Current transformer and Voltage transformer.
7) LCD Display unit.

B. Bluetooth Low Energy (BTLE)

Bluetooth Low Energy (BTLE) is an emerging wireless technology developed by the Bluetooth Special Interest Group (SIG) for short-range communication. In contrast with previous Bluetooth flavors, BLE has been designed as a low-power solution for control and monitoring applications.

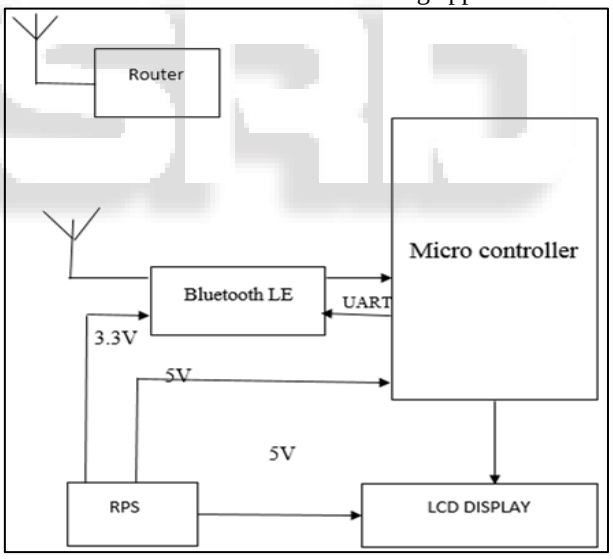

Fig. 1:

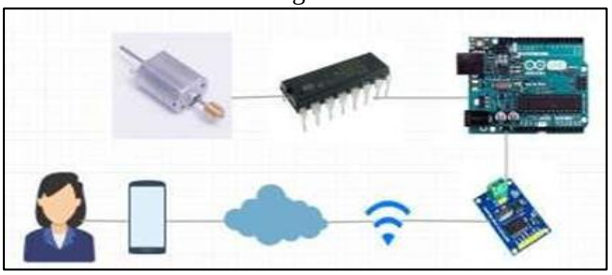

Fig. 2:

The Advantages of BTLE are low power consumption, low cost and BTLE uses a frequency hopping spread spectrum that is inherently more robust to jamming in RF environment.

The disadvantages of BTLE are Covers low area and Wide range control is not possible.

III. PROPOSED SYSTEM

The proposed system consists of UNO microcontroller (arduino), Temperature sensor, Induction motor and WI-FI module. By this system it is easy to controlling the speed of the motor using webpage through WI-FI. Simultaneously, we can also control the direction of the motor whether to be rotated in clockwise or anticlockwise direction. It is possible to measure the temperature of the three phase induction motor using temperature sensor. The PWM method which is used for the controlling the induction motor.

By the PWM method, the output voltage from the inverter can be adjusted by controlling the inverter components. The fixed dc voltage is given to the inverter as the input and the controlled ac output voltage is obtained by adjusting the ON and OFF periods of the inverter components.

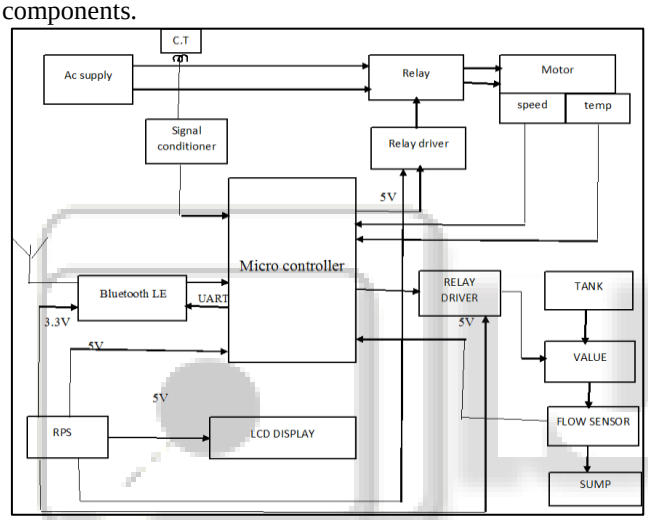

Fig. 3:

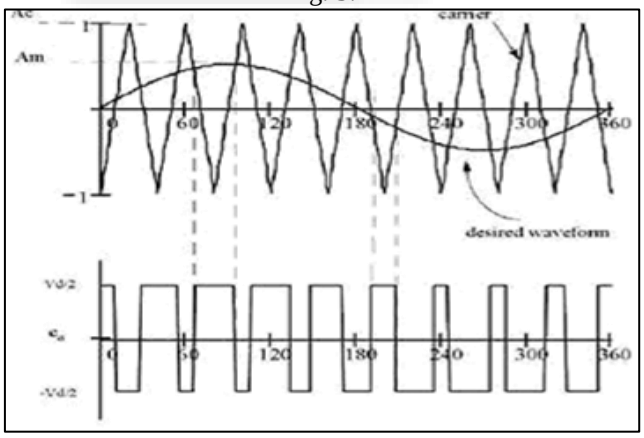

Fig. 4:

IV. BLOCK DIAGRAM

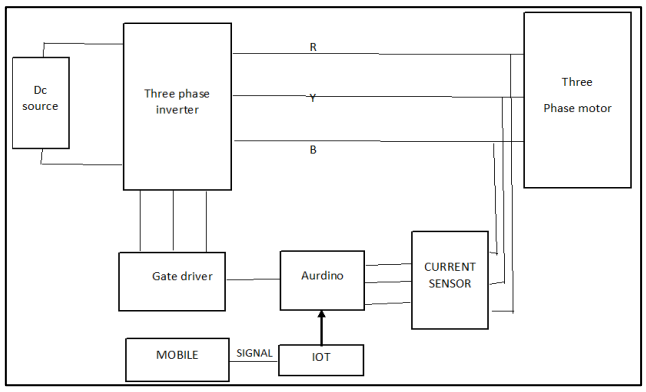

Fig. 5:

A. Smartphone

The smartphone consist various software programs and several application in it. Nowadays, all the people using android phones which connects the user with the network through the internet. The user select the smartphone based on its specification and the processor used in it. The android mobile plays important role in the modern generation.

B. Microcontroller

The microcontroller which is used to control the external hardware devices connected to it. It control the devices for the given condition through the program. The Arduino microcontroller can be classified into various types based on the size and number of pins in it. They are NANO microcontroller, UNO microcontroller and MEGA microcontroller.

The arduino microcontroller will be loaded with a program written on arduino with the basics of C program. The program will be guiding the microcontroller to download the control data from the online cloud web server. The data will be fetched using the Wi-Fi module at regular intervals. The microcontroller can be used to modulate the pins of the motor driver IC to make the motor operate in different modes like forward motoring, forward braking, reverse motoring, reverse braking modes.

C. WI-FI Module

There are a number of ways in which the Arduino microcontroller can be connected with the internet. One way is using the Arduino UNO Wi-Fi board. It is a microcontroller board with Wi-Fi module embedded in it. Another way is to use a separate ESP8266 Wi-Fi module.

D. Motor Driver

This IC is controlled using the arduino microcontroller and it serves as the final step for the proposed system. Using the motor driver IC, the motor can be made to operate in all the four quadrants. Output diodes are also included in the IC for protection against any back EMF produced by the motor.

E. Simulation & Results

The simulation of the system is very simple. The inverter is designed with the IGBT or MOSFET elements. The DC supply is given to the inverter input and the inverted AC supply (three phase) is obtained. The PWM pulse is obtained from the pulse generator and given to the gate terminal of the

inverter element. The inverted output is passed to the filter circuit. The filter circuit consist of inductor and capacitor. It is used to reduce the harmonic level which passed to the load.

F. Without Filter

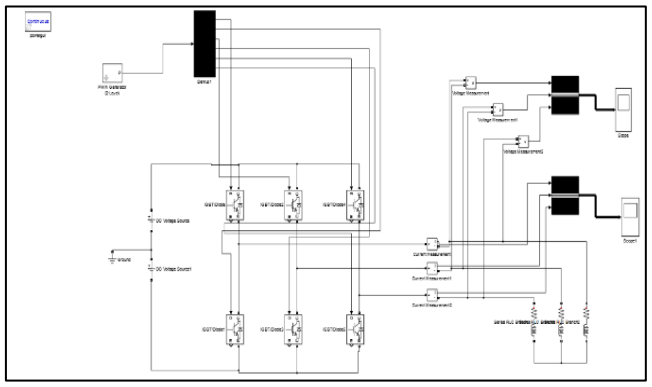

Fig. 6:

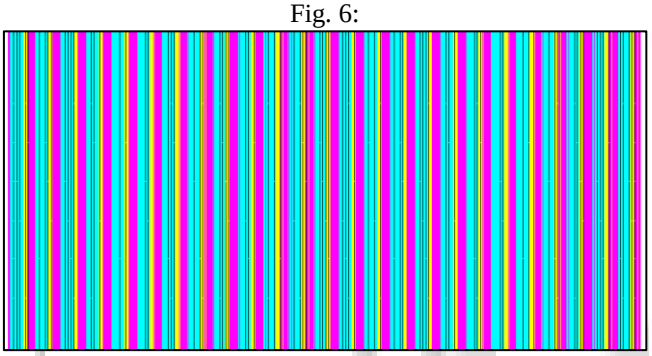

Fig. 7: Voltage Waveform

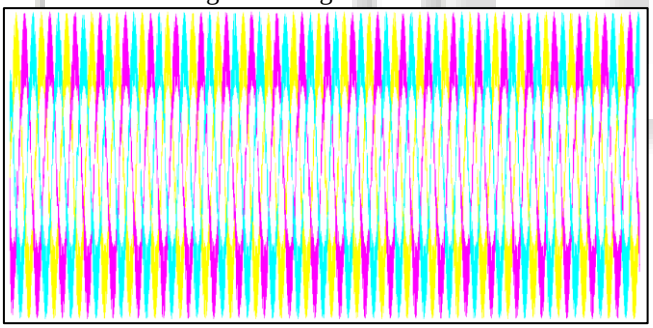

Fig. 8:

G. Current Waveform with Filter

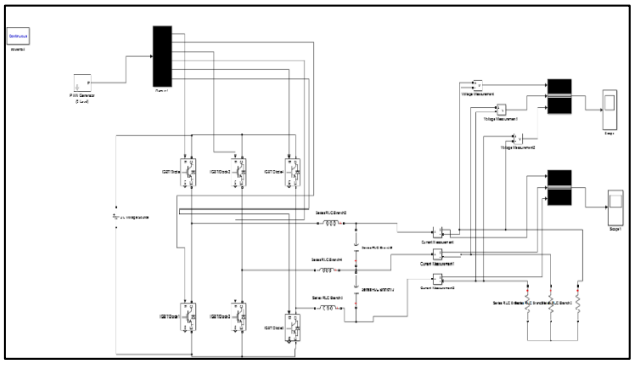

Fig. 9:

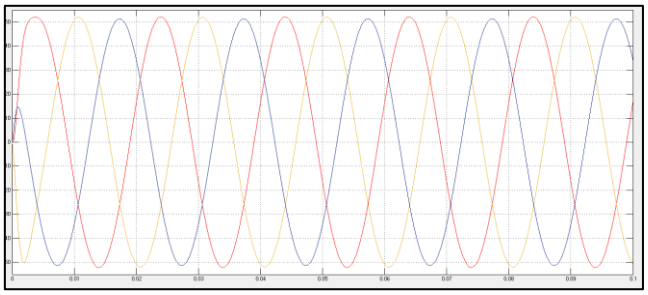

Fig. 10: Voltage Waveform

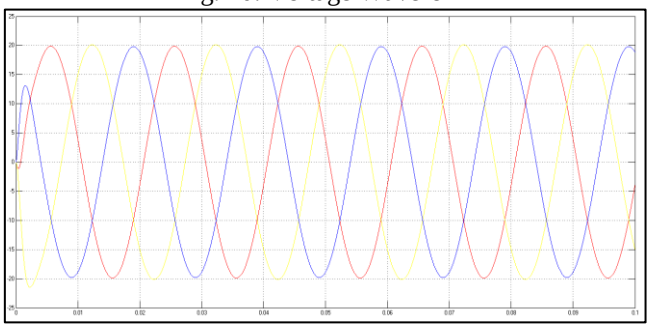

Fig. 11: Current Waveform

V. HARDWARE DIAGRAM

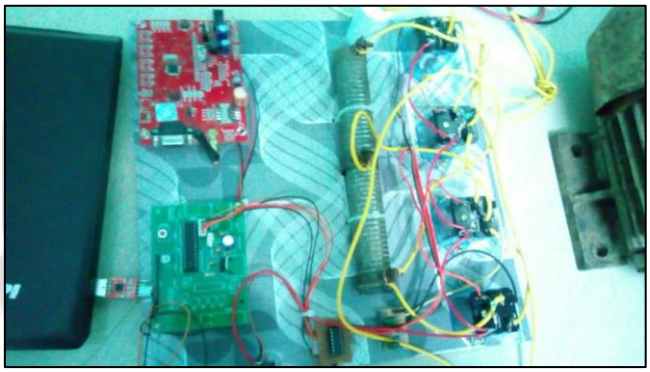

Fig. 12:

VI. CONCLUSION

This paper results the design and implementation of Internet of things for monitoring and controlling of various application and control the function of the three phase motor using wireless communication technique. The key idea of the proposed work is to provide flexible and long distance connectivity between location of the machine and user. The advantages of the developed system are to have a continuous monitoring over industrial applications and also applicable for agricultural application which control the motor. Future work will focus on improvement of above proposed work and adding features to make a reliable smart Industrial monitoring and controlling system. By the future enhancement, the efficiency of the system can be further improved.

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