IOT BASED SPEED CONTROL OF INDUCTION MOTOR USING VOICE RECOGNITION

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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 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 consists of GSM module and Wi-Fi modules are connected to microcontroller. In the load side the load should be either single phase or three 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, induction motor and WI-FI module. 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 or voltage.

Keywords—*ARDUINO UNO, IOT, Single Phase Induction Motor, Node MCU, Voltage regulator.*

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 transfers data over a network without requiring human-to-human or human-to-computer involvement. IOT has evolved from the wireless technologies, micro-electromechanical systems and the Internet. The internet of things is also called as an Internet of objects. Online monitoring system for continuous controlling equipment is established based on IOT sensing technology and communication technology. The concept of "Internet of Things" (IOT) is providing a helping hand to achieve the Industrial automation through remote access. In IOT each device or devices constituting a system will be able to communicate with the other devices or system in the same premises over a common platform. Before the arrival of AC induction motors DC motors were widely used for industrial requirements. With the invention of AC induction motors due to their higher performance over DC motor, industrial automation is being frequently done with it. An induction motor consists of a magnetic circuit interlinking two electric circuits which are placed on the two main parts of the machine: the stationary part called the stator and the rotating part called the rotor. Power is transferred from one part to the motor to other by electromagnetic induction. The primary advantage of the induction motors are its straight forward rotor construction leading to low cost, and low-maintenance requirements, but it is much more difficult to control. In this present era, in most of the applications, AC machines are preferable over DC machines due to their simple and most robust construction without any mechanical commutators. Induction motors

are the widely used in the applications like industrial control, and automation hence, they are often called the workhorse of the motion industry. As far as the machine efficiency, robustness, reliability, durability, power factor, ripples, stable output voltage and torque are concerned, three- phase induction motor stands at the a top of the order. Motor control is a significant, but ignored portion of embedded applications. Applications of motor control span everything from residential washing machines, fans to hand-held power tools, and automatic window lift, traction control systems. All most in all applications there is a drastic move away from analog motor control to precision digital control of motors using different processors. Digital control of induction motor results in more efficient operation of the motor, resulting in longer life, lower power dissipation. Several methods of Induction motor control are in practice today, but the control technique is by generating variable frequency supply, which has constant voltage to frequency ratio. 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. The main objective of this project is voice recognition. In this technology spoken words are converted into text format. 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 and Voice recognition technology to control the speed of the induction motor. Mobile application is developed to recognize the voice of the person and LCD display displays the corresponding value in text format.

II. VOICE RECOGNITION SYSTEM

Voice recognition is a technology in which the spoken words are translated into a text. Some of the recognition system uses special methods to convert a individual speakers section of text into the voice recognition system. This system observes the specific voice of the person and that voice is tuned by recognition, which results in accurate results. User dependent system uses a training concept. User independent system does not use a training concept. These concepts mainly concentrate on who is speaking than what they are speaking."Voice recognition" means "recognizing by voice", something humans do all the time over the phone. As soon as the familiar person says "hello" the listener can identify them by the sound of their voice alone. The project is designed with microphone, microcontroller, amplifier, pulse width modulation circuit and driver circuit. The voice signal is given as input to the microphone o the application and its output is amplified using an amplifier. The amplified signal is given to the pulse width modulation circuit. The pulse shaping circuit generates square pulses which are given to the microcontroller. The pulse waveform for switching of the different electrical appliances used, are stored in the microcontroller. The ARDUINO microcontroller is programmed to compare the received pulse with the stored values. To activate the corresponding relay driver circuits of the electrical appliances the ARDUINO is programmed.

III. 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 unit.

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

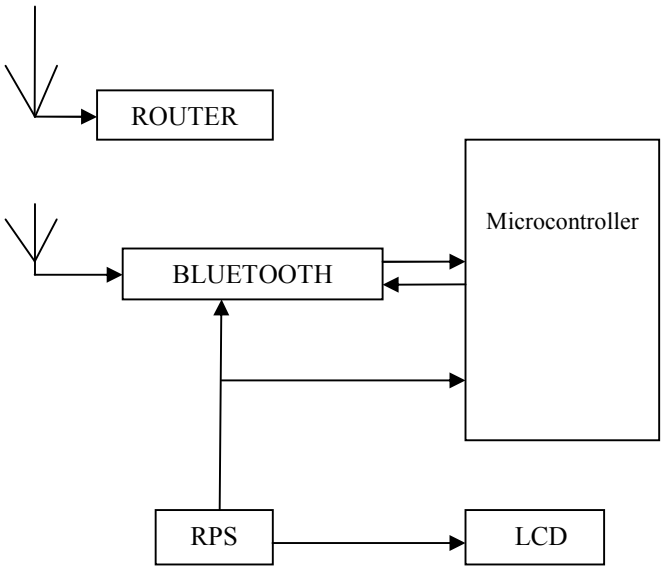

Figure.1 existing system

IV. PROPOSED SYSEM

The proposed system consists of UNO microcontroller (ARDUINO), 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. 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. Nowadays, by improvement of the power electronic device, power flow to the motor is control by the switching action of power switch. The most popular method of supplying single phase AC motor is the conduction angle control. For this control, a TRIAC device is used. It is done by changing the instant of the TRIAC device. This method represents of cost effective solution but it produce very high harmonic content in both motor and supply current wave for there are different methods of speed control of Induction motor using PWM, but PWM method using AC chopper is most preferable. The starting torque is also lower at lower voltages. Thus, even if a given voltage level is sufficient for achieving the running torque, the machine may not start. This method of trying to control the speed is best suited for loads that require very little starting torque, but their torque requirement may increase with speed.

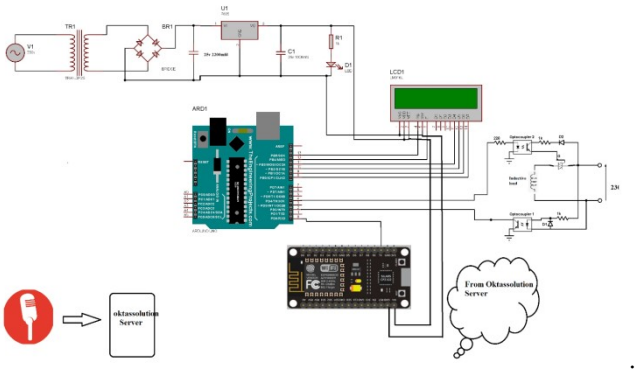

Figure.2 Circuit diagram

Power supply is given to ARDUINO microcontroller. Node MCU is connected to the ARDUINO microcontroller to control the speed the motor. Voltage is controlled by varying the firing angle of TRIAC and thereby connected to ARDUINO. Induction motor is connected to TRIAC controller to control the speed of the motor. LCD is connected as an output device which displays the required speed given by the user. For this purpose a special application is developed.

V.BLOCK DIAGRAM

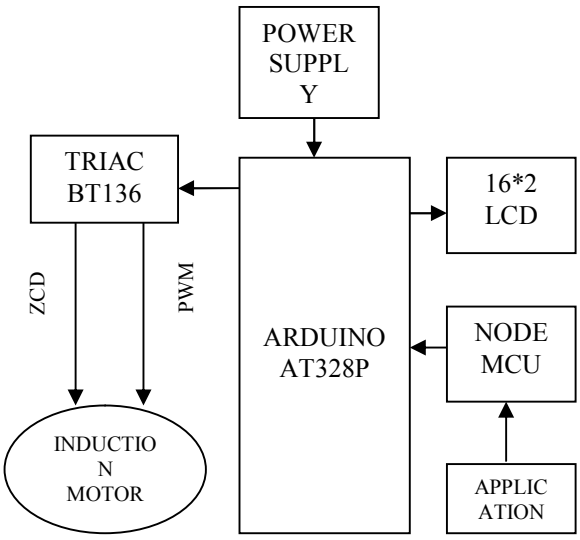

Figure. 3 Block diagram

A. Induction motor

Single phase induction motors are small motors having a wide usefulness where a poly phase supply is not available. They are commonly used in fans, blowers, washing machines, refrigerators. The speed of the induction motor is varied by a narrow range by varying the voltage applied to the stator winding. This method of speed control is suitable where the load varies approximately as the square of speed.

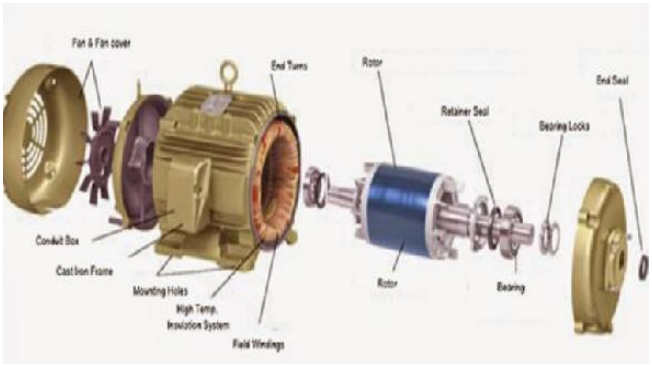

Figure. 4 Parts of Induction Motor

A. *Smartphone*

The smart phone consists of various software programs and several applications in it. Nowadays, all the people using android phones which connects the user with the network through the internet. The user selects the smart phone based on its specification and the processor used in it. The android mobile plays important role in the modern generation.

Figure. 4 Smart phone

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.

Figure.5 ARDUINO UNO

C. *WI-FI Module (Node MCU)*

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.

Figure.6 NODE MCU

D. LCD DISPLAY

LCD (Liquid Crystal Display) screen is an electronic display module and used in wide range of applications. A 16×2 LCD is a basic module and is commonly used in various devices and circuits. These are preferred over seven segments and other multi segment LEDs. The reason is that LCDs are economical, easily programmable, have no

limitation of displaying special and even custom characters, animations and so on. A 16×2 LCD means it can display 16 characters per line per 2 such lines. In this LCD each character is displayed in 5×7 pixel matrix and it has two registers namely, Command register and Data register. The command register saves the command instructions given to the LCD on the other side the data register saves the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the screen. Due to the use of phosphors, OLEDs suffer from screen burn-in and there is currently no way to recycle OLED displays, LCD panels can be recycled, although the technology required to recycle LCDs is not yet widespread. Attempts to increase the life span of LCDs are quantum dot displays, which offer similar performance as an OLED display, but the Quantum dot sheet that gives these displays their characteristics cannot yet be recycled. Since LCD screens do not use phosphors, they rarely suffer image burn-in when a static image is displayed on a screen for a long time.

Figure.7 LCD

VI. CONCLUSION

This paper has presented the design and implementation of Internet of things for controlling of various application and parameters in industries using wireless communication technique. The key idea of the present work is to provide flexible and long distance connectivity between industrial environment and user. The advantages of the developed system are to have a continuous controlling over industrial applications and also control them if going beyond their threshold conditions. Future work will focus on improvement of above proposed work and adding features to make a reliable smart Industrial controlling system.

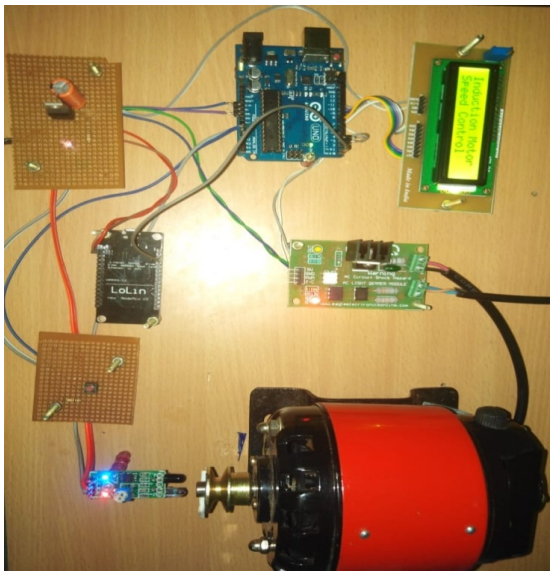

Figure.8 Experimental setup

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