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WiFi based Speed Control of Single Phase Induction Motor

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***Abstract*: Induction Motors account for more than 85% of all motors used in industry and domestic applications. In the past they have been used as constant-speed motors as traditional speed control methods have been less efficient than speed control methods for DC motors. However, DC Motors require commutators and brushes which are hazardous and require maintenance. Thus Induction Motors are preferred.**

As many of the industries use induction motors. So, controlling of induction motor plays a very vital role. So, our project concentrates on controlling the speed of induction motor using Android phone remotely by the help of the wifi technology. We use Android application which uses Wifi to connect to the Wifi modem of control circuit which is connected to the motor. Wifi modem is interfaced with microcontroller. The Microcontroller receives the command from the mobile phone. The wifi modem sends the signal to Arduino Microcontroller. The microcontrollers generate pw waves which control the motor speed.

***Keywords*: WiFi, Induction Motor**

1. Introduction

Electric induction motors run at fixed speed and are ideally suited to application where a constant motor output speed is required .However there are some application where varying motor output speed .While equipment like conveyors may be fine for a fixed speed there are some application which are better suited to running at variable speeds such as fan, pumps, winders and precision tools .A recent trend among customers required automation, to develop the motor varying the speed automatically in this project by using android WiFi. The AC induction motor is the most popular motor use in consumer and industrial application .There are various method of controlling the speed of AC motor. There are several of method is available for speed control of ac motor one of the method is two vary frequency and voltage of motor. Speed modulation of a single-phase motor is usually achieved either by some electrical means, such as reducing supply voltage by auto-transformer, or by switching windings to change the number of motor poles for different operating condition as required. Voltage control is best method, but it allows only limited speed range to be obtained. Now frequency acts as interesting alternative to voltage control, In frequency control method when we control the frequency of the motor the air gap flux is saturate and hence to maintain the air gap flux .Therefore, the stator voltage should also be reduced in proportional to the frequency so as to maintain the air-gap flux constant. The magnitude of the stator flux is proportional to the ratio of the stator voltage and the frequency. Hence, if the ratio of voltage to frequency is kept constant, the flux remains constant. In our project the speed of the induction motor control by using android Wifi. We get wide range of speed in optimum output by using android application. The present world of rapid technological changes there is an urgent demand for the best quality product and services that can achieved by automation in industries. Android is the open source software, manufacturers can modified the operating system to suit their current need and phones .This become cheap and feasible alternative for the manufacturer. The android software support Wifi network stack. Here the proposed system is designed to controlling the speed of induction motor remotely. Android Mobile acts as a transmitter and the received by Microcontroller.

2. Objectives

1. To control the speed of the induction motor using wireless Bluetooth technology.
2. To facilitate the flexible control of the speed of single phase AC induction motor used in industries.
3. Along with speed control, it also gives feedback for temperature rise.

3. Related work

1. Atul M. Gajare, Nitin R. Bhasme “A Review on Speed Control Techniques of Single Phase Induction Motor”

Various types of speed control methods for the single phase induction motor are described. This research paper explains speed control of single phase induction motor by means of frequency ,its implementation and test result also the power conversion section in the given speed drive is consisting IRF840 N-channel MOSFET as a switching element. These MOSFET (four in number) are used in H-bridge configuration to form inverter to supply a.c. current to the motor. The driver circuit for this H-bridge inverter is made up of C124 transistors and MJE 13002 transistors. H-bridge inverter is supplied with 300v power supply and for driver and frequency control circuit, 12V power supply is given. Here, IC SG3525A is used as pulse width modulation IC for frequency control purpose. So,

constructed system the frequency range is 16 to 57 Hz at constant voltage for changing the speed of induction motor.

2. Ming-Fa Tsai; Hsien-Chang Chen "Design and implementation of a CPLD-based SVPWM ASIC for variable-speed control of AC motor drives"

In this paper, we present the design and implementation of an SVPWM ASIC for variable-speed control of AC motor drives, employing an Altera FLEX 10K100A CPLD device. Given the d-q axes sinusoidal references from the EPROM look-up tables, the ASIC can generate alternating-reversing switching PWM sequences to control the motor speed. The firing times of the PWM sequences are functions of the switching period, the DC bus voltage, and the component voltage of the reference vector. The computation of the functions is simple, and hence can be easily carried out by digital hardware. Simulation and experimental results show the performance of the proposed SVPWM ASIC.

3. Ali MonadiMohd Junaidi Abdul Aziz Nik Rumzi Nik Idris "A review on Variable Speed Control techniques for efficient control of Single-Phase Induction Motors: Evolution, classification, comparison"

Single-Phase Induction Motor (SPIM) is the main contributor to the electricity consumption in residential and commercial sectors where three-phase power supply is not available. SPIM efficiencies range from as low as 30% to as high as 65%, depending on the motor type and design. To guarantee the efficient use of energy, the investigation of different SPIM drives have been increased in recent decades. Efficient control policies of SPIM drives offer a great potential for energy saving. Thus research on optimum operation of SPIM drives is escalating. However, there seems to be an absence of a comprehensive review on Variable Speed Control (VSC) techniques for SPIM drives in order to address the need for a thorough insight on SPIMs' drives. In this paper, the principal of control techniques for SPIM drives is explained and their pros and cons are discussed. Ultimately, from different perspectives, VSC techniques for SPIM drives are compared and appraised. It is envisaged that this paper will be a valuable one-stop source of information for researchers working in this topic.

4. Ramazan Bayindir, Ibrahim Sefa "Novel approach based on microcontroller to online protection of induction motors"

The study presents a combined protection approach for induction motors (IMs). To achieve this, the current, voltage, speed and temperature values of the IM were measured with sensors and processed automatically with the developed software in C. The processes were then inserted into a microcontroller. The experimental results have shown that the IM was protected against the possible problems encountered in online operation. The approach presented in this work provides flexibility, accuracy and reliability for smooth protection with the help of the combined protection approach. Moreover, the protection system can easily be applied to larger motors after small modifications in the software developed. It is also expected that the proposed system would provide faster and low cost protection. 2006 Elsevier Ltd. All rights reserved.

5. Ali S. Ba-Thunya, Kexin Wei "Single phase induction motor drives".

This paper deals with a literature survey of various existing power converter topologies, which have been proposed for adjustable-speed single-phase induction motor drives (SPIMD). Included in the paper are several newly proposed power converter topologies. A study of the merit and demerit of different power converter topologies have been carried out. Various converter topologies have been compared in this paper. Among these converter topologies, the adjustable frequency PWM inverter is the best choice for single-phase induction motor drives. However, adjustable-frequency drives have not been widely used with single-phase induction motors. The open-loop constant V/f control law cannot be used with the single-phase induction motor drives as it is used with three phase motors. The variation of the operating frequency at lower speed range with constant load torque causes variation in the motor's slip. A constant V/f control is suitable only over the upper speed range. However, improvements in the low frequency performance require the use of constant power dissipation in the motor. Simulation studies for some of the existing topologies as well as for the proposed ones have been carried out.

4. Proposed system

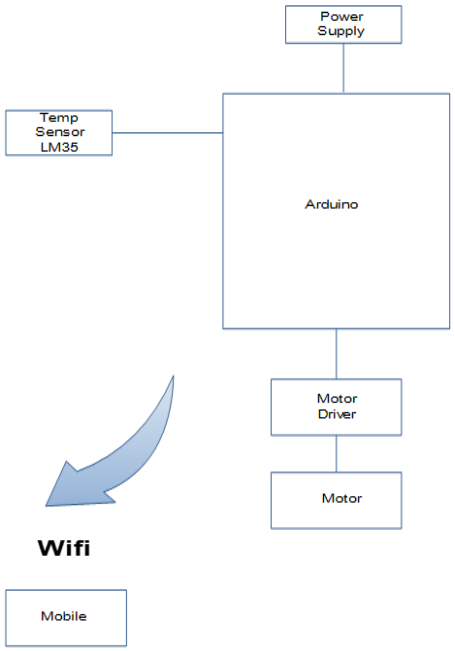

Fig. 1. Proposed system block diagram

A. Methodology

Microcontroller is the heart of the system. We have used Arduino microcontroller in this project. It is getting a 5V power supply from transformer. wifi module, temperature sensor induction motor. Power supply is provided through

microcontroller. The ardiuno that is microcontroller will be interfacing with the Bluetooth module that will act as transmitter for the microcontroller and it will act as receiver to the android application. The necessary data to control the speed of induction motor will be provided to the controller and with the help of android application remotely controlling speed of induction motor is achieved. This is used to drive the triac which provides complete pulse to the motor in order to rotate and to control the speed of inductor motor via android application.

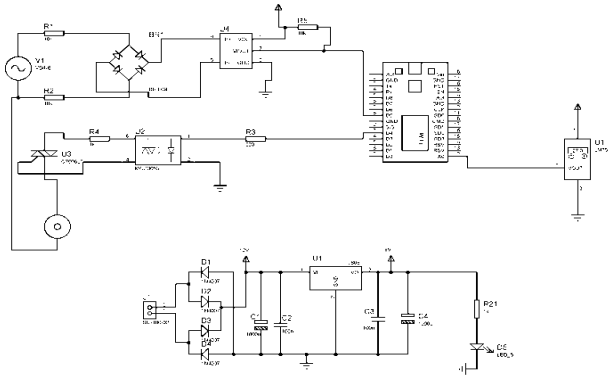

Fig. 2. Circuit diagram

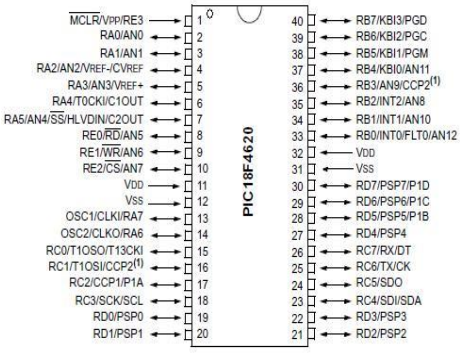

Fig. 3. 2PIC18F4620 Microcontroller

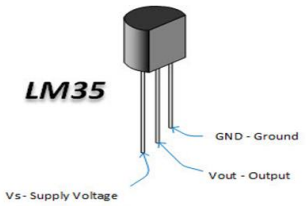

Fig. 4. LM35 Sensor

Table 1
Voltage specifications

Pin No	Function	Name
1	Supply voltage; 5V (+35V to -2V)	Vcc
2	Output voltage (+6V to -1V)	Output
3	Ground (0V)	Ground

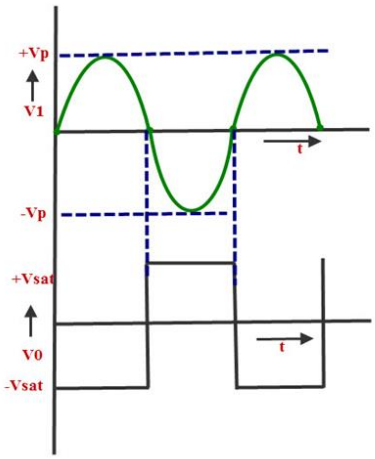

Fig. 5. Zero crossing detector waveform

5. Conclusion

The speed control of single phase induction motor is achieved which has been developing the interfacing between software and hardware for controlling speed of induction motor using android Bluetooth. The demand for remotely operating devices increases. The all hardware component are responded and take command from software. The project has been implemented.

References

[1] Atul M. Gajare, Nitin R. Bhasme, "A Review on Speed Control Techniques of Single Phase Induction Motor".
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