

# SPEED CONTROL OF SINGLE PHASE INDUCTION MOTOR BY ANDROID BLUETOOTH

Vivek N. Gawai<sup>1</sup>, Swapnil K. Jari<sup>2</sup>, Gajanan S. Junghare<sup>3</sup>, Prof. Mandar V. Pathak<sup>4</sup>

<sup>1</sup> UG, Electrical Engineering Department, DES'sCOET, Maharashtra, India

<sup>2</sup> UG, Electrical Engineering Department, DES'sCOET, Maharashtra, India

<sup>3</sup> UG, Electrical Engineering Department, DES'sCOET, Maharashtra, India

<sup>4</sup>Assistant Professor, Electrical Engineering Department, DES'sCOET, Maharashtra, India

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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 Bluetooth technology. We use Android application which uses Bluetooth to connect to the Bluetooth modem of control circuit which is connected to the motor. Bluetooth modem is interfaced with microcontroller. The Bluetooth slave modem receives the command from the mobile phone. The Bluetooth modem sends the signal to AVR Microcontroller. The AVR microcontroller decodes the signal and send to the opto-coupler then respective opto-coupler activates its circuit and give the change in speed of induction motor with respect to change in a firing angle of TRIAC.

**Key Words:** Android, Bluetooth, Induction motor, Speed.

## 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 Bluetooth. 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 Bluetooth. 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 Bluetooth network stack which allow device to exchange data with other Bluetooth device holder. Here the proposed system is designed to controlling the speed of induction motor remotely. Android Mobile acts as a transmitter and the received by Bluetooth receiver interface to AVR microcontroller of 8051 family. AVR is an advance version of 8051 microcontroller. This system comes under wireless technology.

## 2. BLOCK DIAGRAM

The Main components of the project are:

- ATmega16 Microcontroller
- BLUETOOTH MODULE
- OPTO-COUPLER
- HALL EFFECT SENSOR
- LM7805 IC

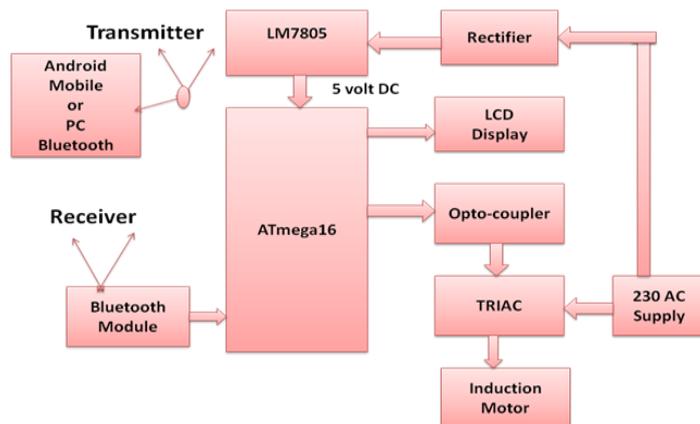


Fig. 1: Block Diagram

### i) ATmega16 Microcontroller

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. ATmega16 is based on enhanced RISC architecture with 131 power full instructions most of the instructions execute in one machine cycle. ATmega16 can work on maximum frequency of 16MHz. ATmega16 has 16KB programmable flash memory, static RAM of 1KB and EEPROM of 512byte. The endurance cycle of flash memory and EEPROM is 10000 and 100000 respectively. ATmega16 is a 40 pin microcontroller there are 32 I/O lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD. ATmega16 has various in-built peripherals like USART, ADC, Analog comparator, SPI, JTAG etc. Each input output pin has an alternative task related to inbuilt peripherals. AVR microcontroller 4times faster than 8051 microcontroller. It based on RISC architecture with PWM channel and inbuilt ADC. Memory size is large as compare to 8051 microcontroller and consumes less power .Due to this specialty we use ATmega 16 microcontroller.

### ii) BLUETOOTH MODULE

Bluetooth is a wireless technology standard for exchanging data over short distances. The device named after even number is defined to be master or slaver when out of factory and can't be changed to the other mode. But for the device named after odd number, users can set the work mode. There are different type of Bluetooth such as HC-

03,HC-04,HC-05,HC-06.In HC-04 and HC-06 having two modes are slaver mode and master mode. If we need master mode state it clearly or place an order for HC-04 directly. The naming rule of HC-06 is same. But for user HC-03 and HC-05 are available other for industrial level. We have use in our project HC-05 Bluetooth module. It is an easy to use Bluetooth SPP module design for transparent wireless connection set up. The Bluetooth module HC-05 is a MASTER/SLAVE module. For factory setting slave module are use it cannot initiate a connection between other Bluetooth devices. But can accept connections. Master module can initiate a connection to other devices. The user can use it simply for serial port replacement to establish connection. Between MCU and GPS, PC. Due to -80 dBm sensitivity and up to +4dBm RF transmit power with PIO control, we use HC-05 Bluetooth module.

### iii) OPTO-COUPLER

In electronics, an opto-isolator is also called a photo coupler or optical isolator, is a component that transfers electrical signals between two isolated circuits by using light. Opto-isolators prevent high voltages from affecting the system receiving the signal. Opto-isolator contains a source of light almost always near to LED, that converts electrical input signal into light a closed optical channel and a photo sensor which detects incoming light and either generates electrical energy directly. It does not make electrical connection between two devices. We use MOC3021 opto-coupler.

### iv) HALL EFFECT SENSOR

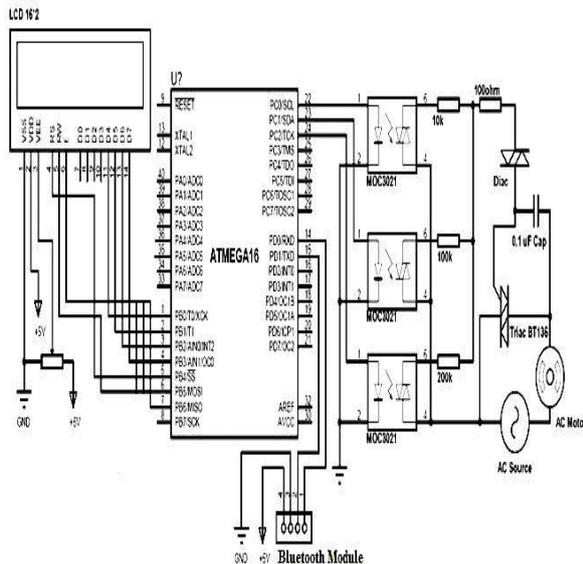
The Hall element is the basic magnetic field sensor It Requires signal conditioning to make the output usable for most applications. If magnetic field is present the output voltage of a sensor is present. If the absence of magnetic fields it output voltage is zero. Its helps for the counting the RPM of machine. For display the current status of RPM its interface with LCD display and ATmega16 microcontroller.

### v) LM7805 IC

This series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with Single point regulation. Each of these regulators can deliver up to 1.5 A of output current. The internal current limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents, and also can be used as the power-pass element in precision regulators. For conversion of 12v dc supply to 5v dc supply its use. 5vdc supplies require for microcontroller and other low voltage electronics devices.

### 3. WORK TO BE PROPOSED

### 4. RESULT



In this project speed of the induction motor is control by android phone with Bluetooth wireless communication. Control the speed of the AC motor using Bluetooth control. The speed can be controlled from 0% to 100% as four different speeds.

Sr. No.	No. Of Opto-Coupler	Resistance (Ohm)	Speed (RPM)
1.	1	25K	2860
2.	2	50K	2820
3.	3	100K	2740
4.	4	200K	2700

Fig. 2: Circuit Diagram

### 5. CONCLUSIONS

The embedded system is a computer system with a dedicated function within a larger mechanical or electrical system. The combination of software and hardware is embedded system. This project based on it. The speed of the AC motor is measured using wireless speed measurement technique by using Hall Effect sensor it is achieved. Speed control is done using Resistance control method. User can increase and decrease the speed of the AC motor through android Smartphone. The ATmega16 Microcontroller is programmed using Embedded C language. This project uses regulated 5V, 500mA power supply, LM7805; a three terminal voltage regulator is used for voltage regulation and it gives 5v dc constant supply to the electronics devices. Bridge type full wave rectifier is used to rectify the AC output of 230/12v step-down transformer.

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.

The application will be installed in the phone which uses Bluetooth device of the android phone. Various types of control switches are present in the application. On the other side the control circuitry of motor also contains a Bluetooth modem which is used connect with the phone. The Bluetooth modem is connected with microcontroller which is used to decode the command sent by mobile. Microcontroller is then connected with opto-coupler, to which various Opto-coupler are connected in parallel. The opto-coupler are connected with Resistance speed control. That is, we use armature resistance to control the speed of motor. The regulated power supply is given to the control circuit. Speed of the AC motor control given by changing firing angle of TRIAC with the help of ATmega16 micro controller. Varying speed of AC motor by means of changing firing angle of any SCR is very widely used method. Back to back connection of control circuit and machine circuit possibility create harmonics and hence capacitor use as filter in circuit.

### 6. FUTURE SCOPE

The main purpose of our project is to control the speed of induction motor by android application. In this project opto-coupler, Bluetooth module, machines are interface with AVR microcontroller. The AVR microcontroller receive command signal from Bluetooth module and decodes it first and then send signal to opto-coupler. The main disadvantage of system is the Bluetooth module support only for short distance. This can be eliminated using GSM, WI-FI, and also dual tone multi frequency signal. We can increase the distance.

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