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Android Based Speed Control of Single Phase Induction Motor

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Abstract

Android is open source software; manufacturers can modify the operating system to suit their respective needs and phones. The Android platform includes support for the Bluetooth network stack, which allows a device to wirelessly exchange data with other Bluetooth devices. The application framework provides access to the Bluetooth functionality through the Android Bluetooth .Here the proposed system is designed to controlling the speed of induction motor using android application where the remotely controlling speed of induction motor is achieved. Android mobile act as a transmitter and the received by Bluetooth receiver interfaced to AVR microcontroller of IC 16F877A family. AVR is an advanced version of IC 16F877A microcontroller. Each time data is sent by android application as per code written is executed by AVR to deliver supply signal to Triac through optical isolation.

Keywords: *Induction Motor, Triac, AVR Microcontroller, Bluetooth module.*

1. INTRODUCTION

Motor speed control of INDUCTION motor is nothing new. A simplest method to control the rotation speed of an INDUCTION motor is to control its driving voltage. The higher the voltage is the higher speed the motor tries to reach. In many applications simple voltage regulation would Cause lots of power lesson control circuit, so a pulse width modulation method

(PWM) is used in many INDUCTION motor controlling applications. In the basic Pulse Width Modulation (PWM) method, the operating power to the motors is turned on and off to modulate the current to the motor. The ratio of "on" time to "off" time is what determines the speed of the motor.

The H-Bridge is used for motor driver. The H-Bridge is widely used in Robotics for driving INDUCTION motor in both clockwise and anticlockwise. As shown in the circuit diagram in H Bridge is made using IC L293D.

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, induction and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

1.1 Objectives

1) To control the speed of the single phase AC motor using wireless Bluetooth technology
2) To control the speed of the single phase AC motor using limited power supply.
3) To facilitate the flexible control of the speed of single phase AC induction motor used in industries.
4) Along with speed control, it also gives feedback for temperature rise.
5) To detect the over voltage and low voltage and indicates in mobile phone as well as in the kit display.
6) If any fault happens and MCB trips it will indicate in the kit display as well as in mobile phone via Android applications.

1.2 Project Overview

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with

various devices, controls the data and thus finally gives the result. The project "Single phase AC induction motor speed controlling based on Android mobile phone "using PIC16F877A microcontroller is an exclusive project which is used to control the Single Phase induction motor using resistance control method by relays.

2. EMBEDDED SYSTEMS

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems.

High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Mobile phones etc .Lower end embedded systems – Generally 8, 16 Bit Controllers used with a minimal operating systems. Example Washing Machine, Microwave Ovens, where they are embedded in.

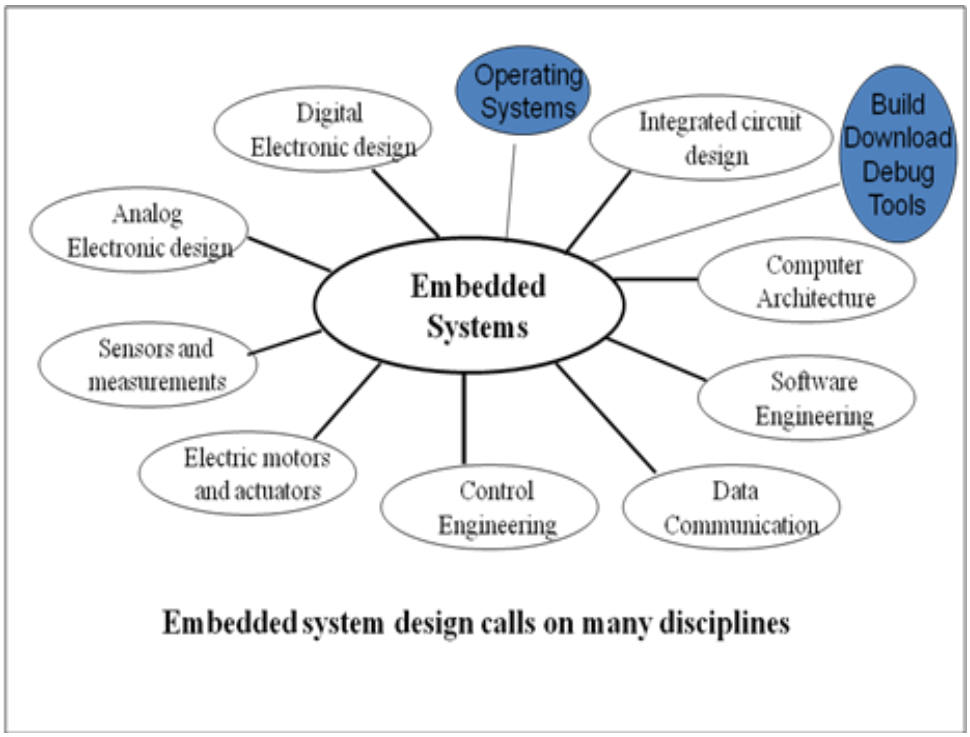

Fig: 2 System Design Cells

3. CIRCUITS DIAGRAM:-

The circuit uses standard power supply comprising of a step-down transformer from 230Vto 12V and 4 diodes forming a bridge rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor of about 470µF to 1000µF. The filtered dc being unregulated, IC LM7805 is used to get 5V DC constant at its pin no 3 irrespective of input DC varying from 7V to 15V.

The input dc shall be varying in the event of input ac at 230volts section varies from 160V to 270V in the ratio of the transformer primary voltage V1 to secondary voltage V2 governed by the formula V1/V2=N1/N2. As N1/N2 i.e. no. of turns in the primary to the no. of turns in the secondary remains unchanged V2 is directly proportional to V1.Thus if the transformer delivers 12V at 220V input it will give 8.72V at 160V.

Similarly at 270V it will give 14.72V.Thus the dc voltage at the input of the regulator changes from about 8V to 15V because of A.C voltage variation from 160V to 270V the regulator output will remain constant at 5V.

The regulated 5V DC is further filtered by a small electrolytic capacitor of 10µF for any noise so generated by the circuit. One LED is connected of this 5V point in series with a current limiting resistor of 330Ω to the ground i.e., negative voltage to indicate 5V power supply availability. The unregulated 12V point is used for other applications as and when required. **See figure 3.**

4. POWER SUPPLY

The 12V INDUCTION supply for the circuit is obtained from a 12V adaptor with 500mA rating. Any other source such as a 12V lead-acid battery can also be used. This 12V INDUCTION is used for operation of the relays used in the circuit.

The regulated + 5V supply for the microcontroller is de¬rived using regulator IC 7805 (ICI). Diode D 1 protects the circuit from reverse sup¬ply connections. Capacitor Cl filters out the ripples present in the incoming INDUCTION voltage. **See figure 4.**

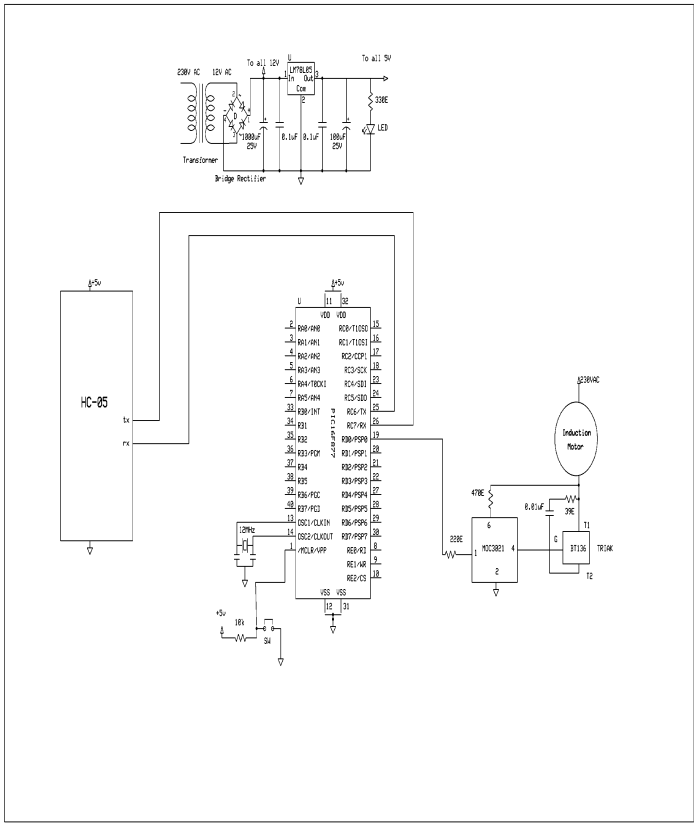

Fig:3 Circuit Diagram

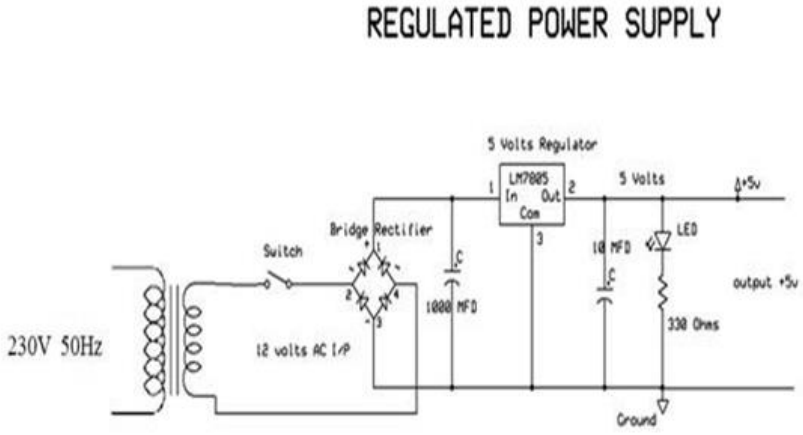

Fig 4 Circuit diagram of Regulate Power Supply with Led connection

5. HARDWARE DESCRIPTION

Speed control of single phase AC induction motor based on Resistance control.

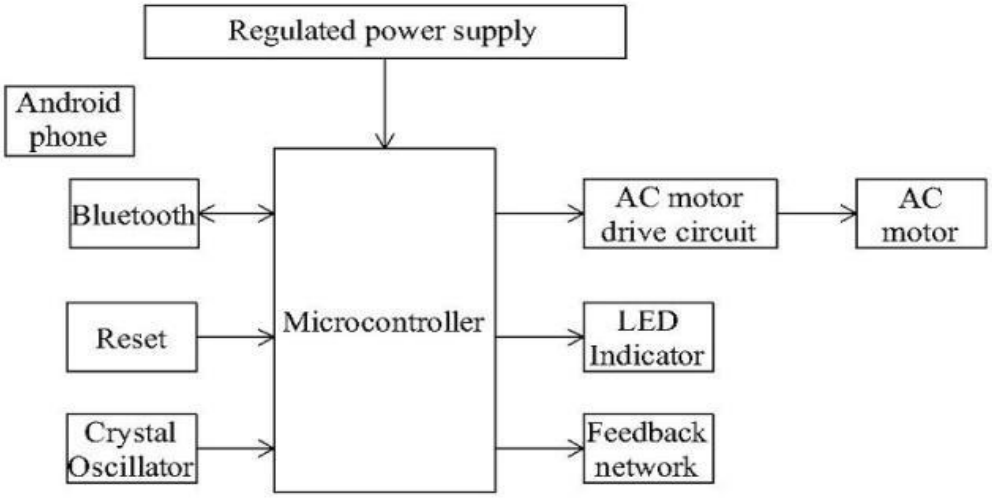

Fig.:5 Main Block Diagram

6. HARDWARE REQUIRED

1) PIC 16F877A
2) Resister
3) Capacitor
4) Diodes
5) Crystal
6) Hc05
7) Induction motor
8) Regulated Power Supply (RPS)
9) LED Indicator
10) Bluetooth Module

6.1 Microcontroller

Fig: 5.1 PIC16F877A

Introduction:-

The PIC microcontroller PIC16F877A is one of the most renowned microcontrollers in industry. This controller is very convenient to use, the coding or programming of this controller is also easier. One of the main advantages is that it can be write-erase as many times as possible because it use FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output. PIC16F877A is used in many PIC Microcontroller Projects. PIC16F877A also have many applications in digital electronics circuits

Pin Configuration:-

As it has been mentioned before, there are 40 pins of this microcontroller IC. It consists of two 8 bit and one 16 bit timer. Capture and compare modules, serial ports, parallel ports and five input/output ports are also present in it. **See figure 6.**

7. VOLTAGE REGULATOR 7805

Features

- Output Current up to 1A.
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V.
- Thermal Overload Protection.
- Short Circuit Protection.
- Output Transistor Safe Operating Area Protection.

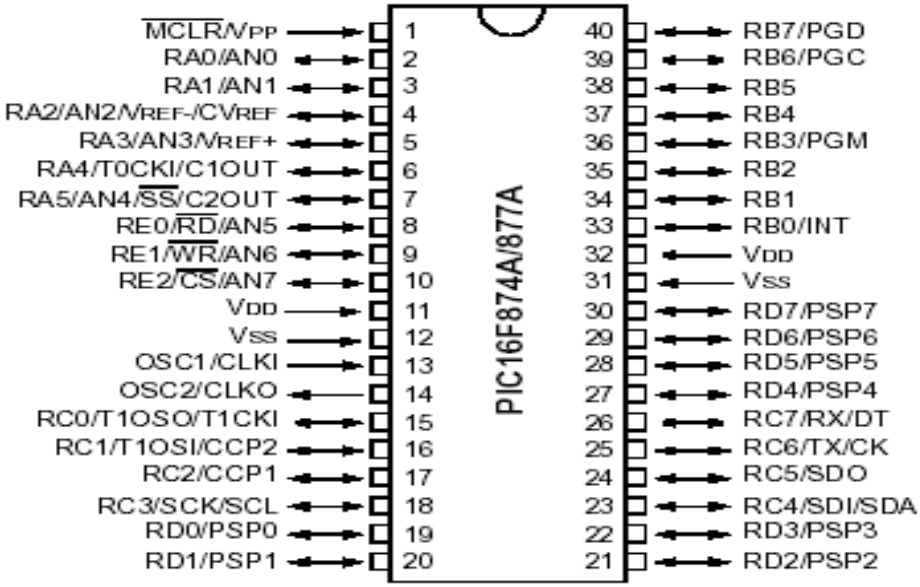

Fig: 6 Pin Diagram of PIC16F877A

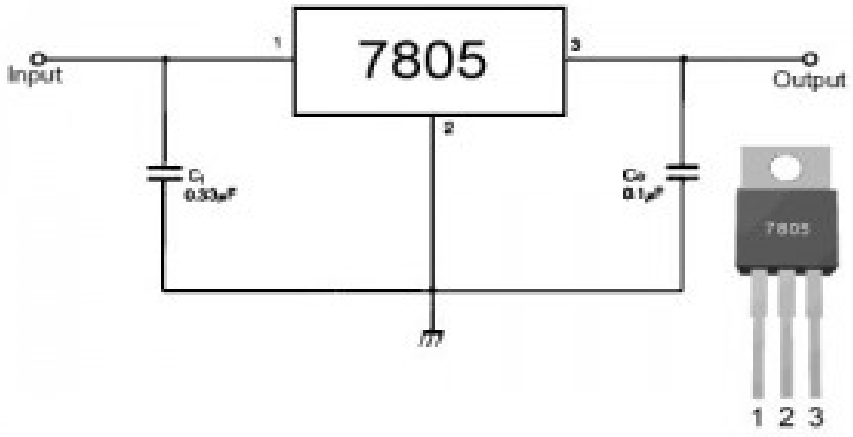

Fig.6.1 (a) Voltage Regulator 7805

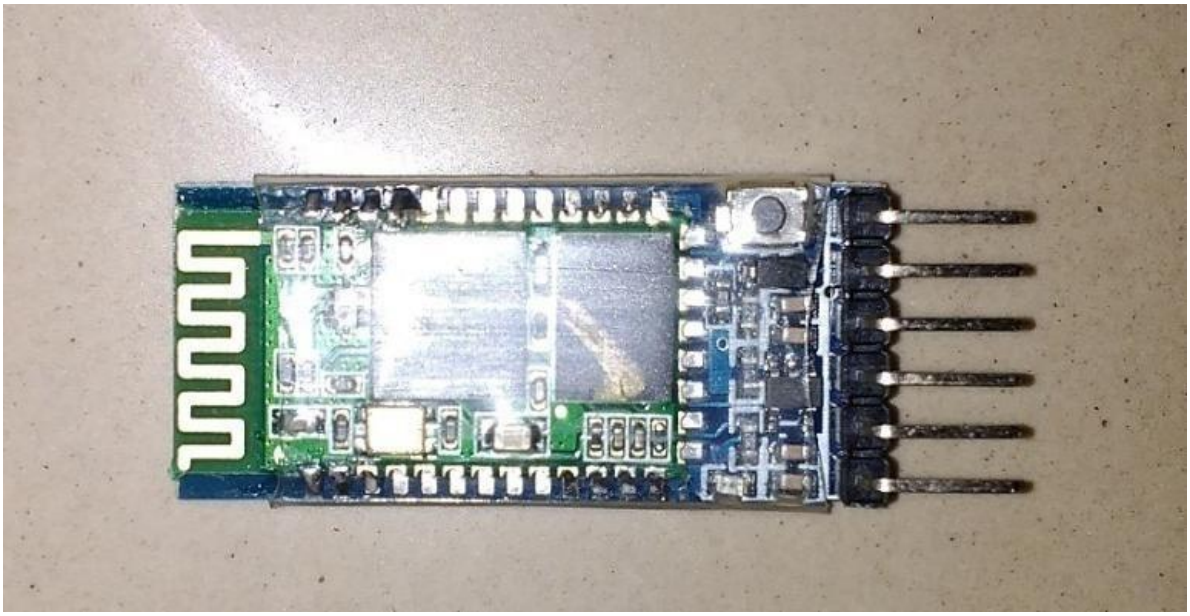

Fig: 8 Bluetooth modules used (JY-MCU Hc-05)

8. BLUETOOTH MODULE HC-05:-

The 'Bluetooth' is the short-range radio link technology designed to "connect" an array of devices including mobile phone, PCs and PDAs. In our project we are using Hc-05

Bluetooth module. In our project Bluetooth module is used in the motor drive circuits to connect with Android mobile phone by the help of Android application.

9. INDUCTION MOTOR:-

An induction or asynchronous motor is an AC electric motor in which the electric current in rotor needed to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding. An induction motor can therefore be made without electrical connections to the rotor as found in universal, DC and synchronous motors. An induction motor's rotor can be either wound type or squirrel–cage type.

10. BLUETOOTH ROBOT REMOTE CONTROL:-

Here in the project the Android smart phone is used as a remote control for operating Bluetooth module, Induction Motor is interfaced to the Microcontroller.

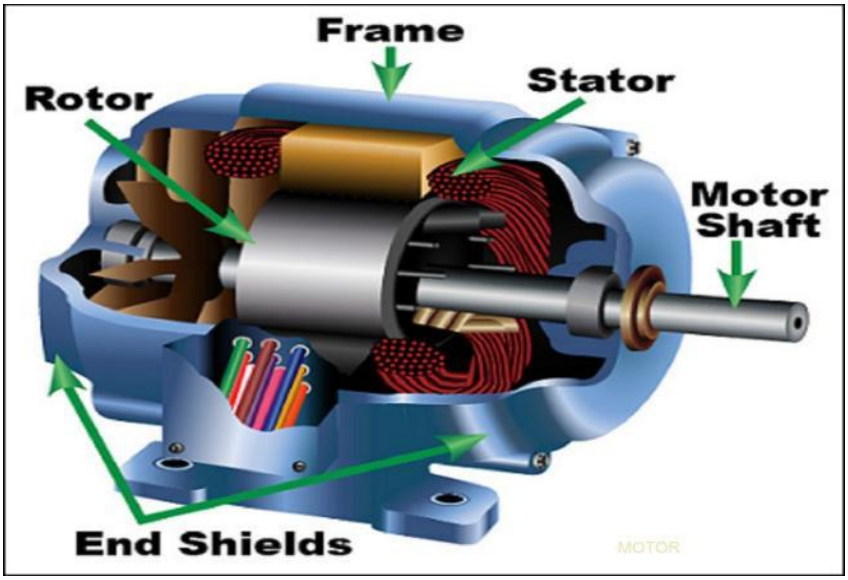

Fig: 9 Induction motor

Fig: 10 Bluetooth Robot Remote Control

11. RESULT:-

The project "Single Phase Induction Motor Speed Controlling Based on Android Mobile Phone" was designed such that to control the speed of the AC motor using Bluetooth control technique by making use of resistance control method to the speed of the motor using android mobile with Bluetooth wireless communication.

CONCLUSION:-

This paper helps in the control and Speed of the induction motor. This paper "Android Based Speed Control Single Phase Induction Motor" has been successfully designed and tested. Integrating of all the hardware components used has developed it. Presence of every module has been reasoned out and placed carefully. Thus contributing to the best working of the unit. It also put forward a cost effective model for controlling and monitoring of induction motor. The parameter set values are stored in the microcontroller.

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