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Speed Control of Induction Motor by using TRIAC and PWM Method

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ABSTRACT: Speed control of induction motor is a new technique.It has a high-efficiency AC induction motor that drives PWM modulated sinusoidal voltage and low designexpenses. Circuit operation is controlled using the 8051 family MicrocontrollerThe circuit is capable of supplying singlePhase induction motor with different AC voltage. Main ACThe voltage is directly modulated. It requires less numberActive and inactive ingredients which are relatively expensivea converter is a proposed control technique used in consumersand industrial products. The terminal voltage on the stator winding of the motor can be varied to achieve the desired speed control by controlling the firing.Angle of semiconductor power devices (TRIAC in our project). For any firing angle.

I.INTRODUCTION

In this paper speed control of induction motor is done using various methods using triac. Different devices use control gate terminal of triac, devices are 555 timer IC, pulse transformer and diac controls firing angle of triac.As we know that the direction of the motor torque developed is directly proportional to the square of the voltage so by controlling the voltage at the stator terminal through the triac and its gate pulse the voltage is reduced and applied to it by increasing the firing angle. . Because of the relationship between the motor stator and the voltage and torque, the speed of the motor is controlledPWM is a commonly used technique for controlling inertial electrical devices, made practical by modern electronic power switches. The average value of the voltage and current supplied to the load is controlled by rapidly switching on and off the switch between the supply and the load.The longer the switch is on compared to the off period, the more power is delivered to the load. Duty cycle describes the proportion of 'on' time at regular intervals or 'periods' of time; A lower duty cycle is associated with lower power, since the power is off most of the time

II. METHODOLOGY

This project attempts a new speed control techniquefor single phase AC induction motor. It costs less, moreEfficiency drives capable of supplying single phaseInduction motor with PWM modulated sinusoidal voltage.Control circuit operation by the 8051 familyMicrocontroller. The goal is to replace the devicecommonly used TRIAC phase angle control drives. The circuit is capable of supplying a single phase induction motor(inductive or resistive load) with different AC voltages.
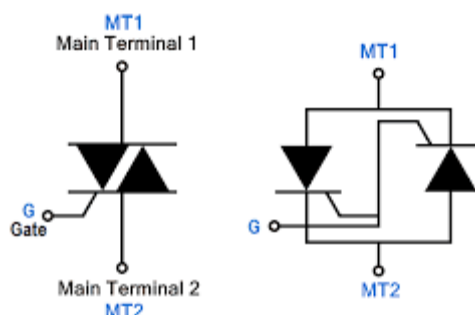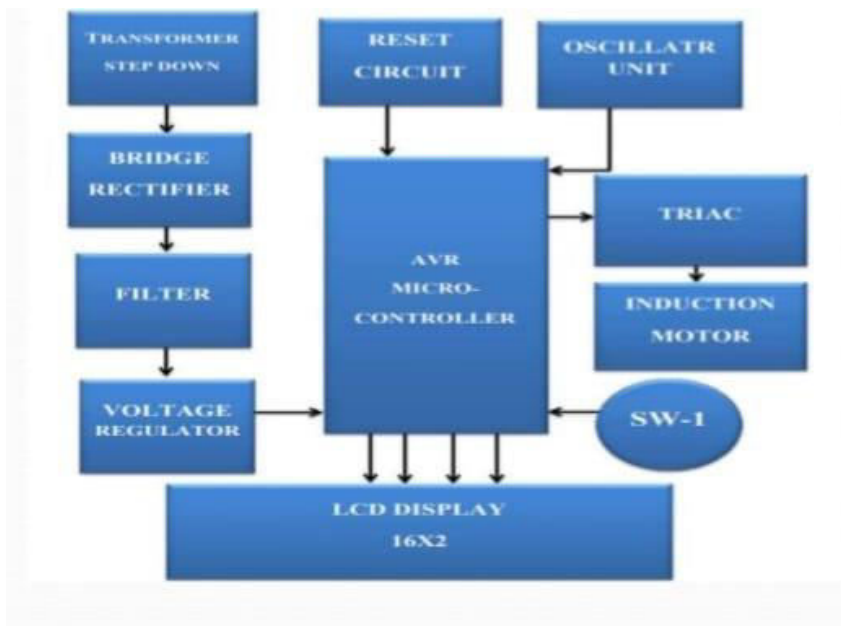

Fig 1: Triac symbol

Fig 2: block diagram

This is similar to TRIAC control, voltage can vary from zero to a maximum value applied to the load. On the other hand, a pulse width modulation technique(PWM) is used and compared with the phase angleUsed for control and TRIAC, it has very low high outputOrder harmonics. Because the circuit is aimed at low cost,Medium-power applications for generating output voltagesWaveform does not use a conventional convertertopology:It rectifies the mains AC voltage. Thereforecompared to expensive converters, it requires minimalNumber of active and passive energy elements. The

The device tried here takes advantage of both the low costPhase angle control and minimum harmonics Content and more functionality that standard converters achievetopologyThe drive then uses a PWM controlled A load in series with a bridge rectifier. Based on this driveOn this the proposed control technique is used in consumers and Industrial products.The input terminals of the rectifying bridge areconnected in series with the load. Output terminals(rectified side) is a power transistor are connected between them. An electric current cannot flowfrom the rectifying bridge while the power transistorOFF then the load which is in series and remains in off state. Bridge output terminals are short-circuited, whenthe power transistor is on and then current can flowby the rectifying bridge and thus by the loadThe load power is controlled by changing the dutyCycles of PWM pulses. So special care is takenCircuits such as PWM are synchronized with pulsessupply phase through the zero voltage sensing point.
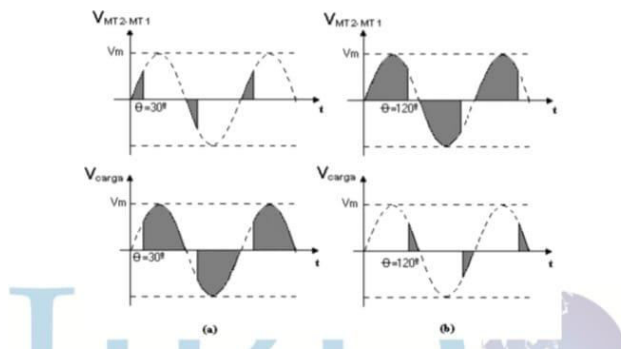

Fig 3: zero crossing of sinwave

III. EXPERIMENTAL EQUIPMENT

The proposed Speed control technique components and they are: Arduino Uno, LCD display, HC-49/SM ,HC-49/U.
Bridge Rectifier unit , Voltage regulator.

Fig. Arduino uno

Fig. LCD display

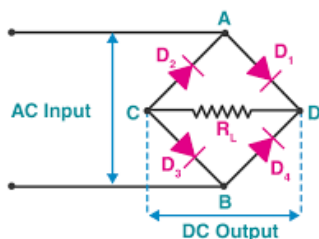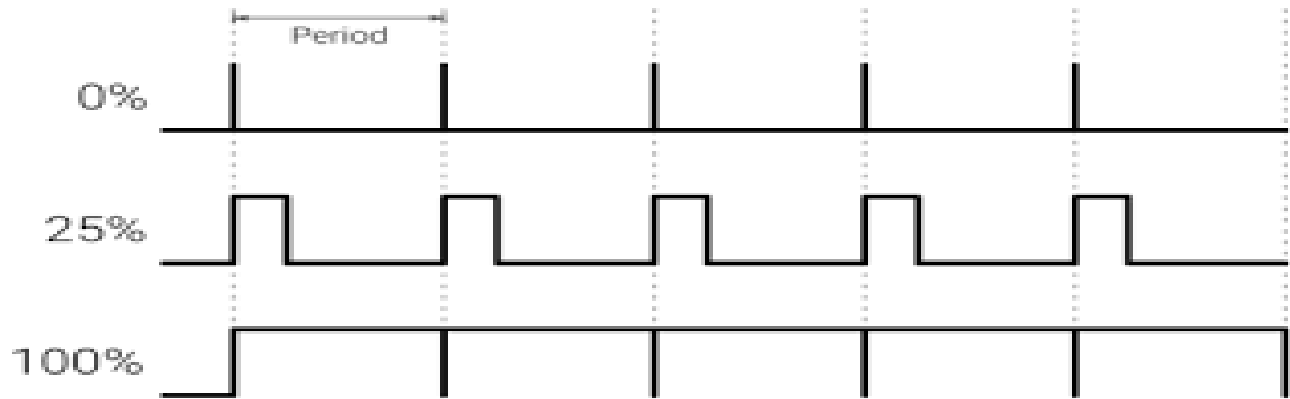Fig. HC-94

Fig. HC-49/SM

Fig. bridge rectifier

Fig. Voltage regulator

IV. PWM WAVE FORM

V. APPLICATION

There are some known applications are presented below:

- Tools.
- Compressor drives and systems.
- Conveyor system.
- Fans and air conditioners.
- Hydraulic and irrigation pumps.
- Transport equipment

VI.CONCLUSION

Thus, we have proposed a new method to control the speed of a single-phase induction motor in both directions using a semiconductor device TRIAC and PWM. This method is effective and efficient method to control the speed of single-phase induction motor in today's world.
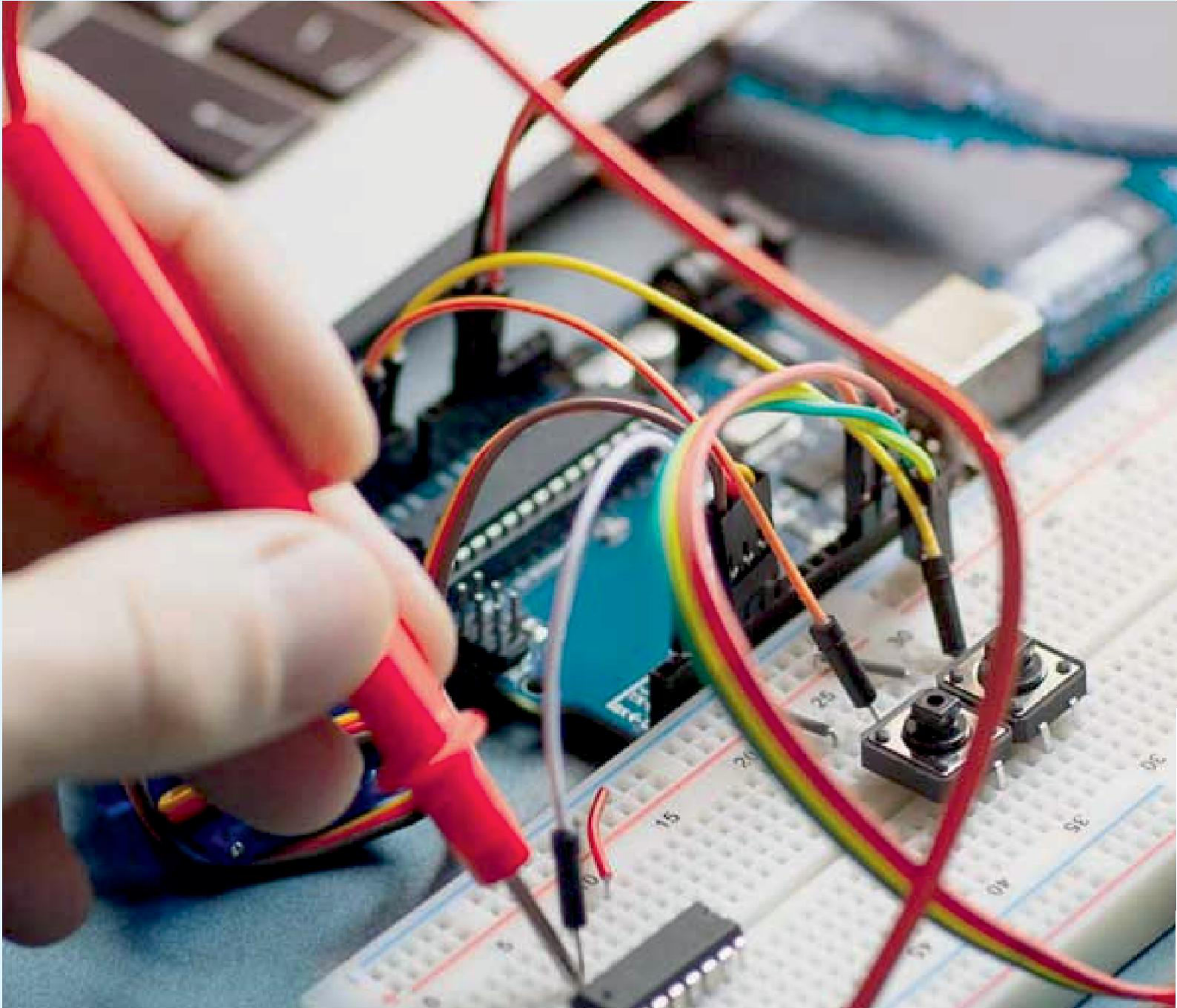
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