

Gesture Based Speed Control of A.C. Motor by Using A MATLAB

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ABSTRACT

In our project, we include MATLAB, Power electronic devices and microcontroller. MATLAB used for gesturer reorganization purpose. MATLAB communicate with micro controller through UART protocol. Here we use 89S52 Micro controller for programming purpose. Gesture will recognize through MATLAB and pass the signal through UART protocol and receive by microcontroller according to position of AC motor.

Keywords: UART NRF 24L01, MATLAB Image processing, Zero crossing Detector, TRIAC BTA06, Microcontroller 59S52, A.C. Motor.

I. INTRODUCTION

AC Motor control is very common in industrial application. The developments in this kind of project are widely used in most electronic devices nowadays. There are many application that have been developed based on motor control in electronic and electrical field such as automation, Different manufacturing system and computer integrated manufacturing. Various AC motor control techniques are used additionally there are different microcontroller based AC motor controllers accessible yet it will bring about constraints with respect to remote control utilizations of apply autonomy.

This work manages the course and speed control of AC Motor through picture preparing in MATLAB. A controlling a mono phase motor or any AC load based on phase-angle adjusting with a TRIAC or AC switch and a Microcontroller as a driver. The electronic driver with a TRIAC and microcontroller presented in this document is cost effective and easy for designers to implement. Motor will be controlled on the premise of

picture of hand caught by webcam. Picture will be procured and prepared through Image handling Programming in MATLAB. Among various microcontrollers is used due to its high performance, low power, advanced architecture and many more features. The objective of this venture is to acquire microcontrollers based AC motor control through picture handling programming in MATLAB which will bring about remote control of extensive variety of use.

II. METHODS AND MATERIAL

MATERIAL

- AC Motor
- Step down Transformer
- Bridge Rectifier
- IC 7805
- Capacitor 1000 μ F
- Opto-coupler 4N25
- Zero crossing circuit MOC3021
- Triac Q7010L5
- Micro-controller 89S52 ATMEGA328
- PROTIUS 8.0

- Crystal Oscillator
- MATLAB
- Webcam
- UART NRF24L01

METHODS

LM7805 IC: IC's are the voltage regulators which are used to remove fluctuations and get fixed DC supply. To provide 5V supply to the microcontroller LM7805 is used to convert 12V into 5V.

Microcontroller: Microcontroller is the single chip used for many applications. Here microcontroller is used for the programming.

TRIAC: Triac is the bidirectional triode Thyristor. It allows the flow of current in both directions. Triac is triggered by giving positive or negative supply to the gate terminal.

AC Motor: In this for the purpose of speed control we are using AC Motor. Variable speed control is used in many applications now days. There are two ways for speed control either changing the voltage or changing the line voltage frequency.

UART Protocol: UART is the Universal Asynchronous Receiver/Transmitter. In asynchronous transmission, the sender sends a Start bit, 5 to 8 data bits first LSB, an optional Parity bit, and then 1, 1.5 or 2 Stop bits. UART takes bytes of data and transmits the individual bits in a sequence. UART transmits the data in bits and it requires only two wire to transmit the data between devices. In this communication, two UARTs communicate with each other directly. UART receives data from a controlling device like CPU in serial form and transmits it in serial to the UART. Then UART converts the serial data into parallel data, it adds a start bit, a stop bit and a parity bit to create the data packet. The receiving UART then converts the data back into parallel form and removes the start bit, parity bit, and stop bits. Finally, the receiving UART

transfers the data packet in parallel to the data bus on the receiving end. There is no clock signal to synchronize the output of bits from the transmitting UART because UART transmit data asynchronously. Here we have used NRF24L01.

Power supply circuit: The power supply circuit supplies power to the microcontroller through opto-coupler. In power supply circuit we have used step down transformer which step-down 230V AC in to 12V AC and gives to the bridge rectifier circuit. Bridge rectifier converts 12V AC to 12V DC. Here we have used IC 7805, it gives 5V supply from 12V. Capacitor is used to smoothing and regulation purpose.

Image processing/ Gesture Recognition: Image processing is a method to perform operations by applying an image, in order to get some information from the image. It is a type of signal processing in which input is an image and output will be some characteristic, feature, image or graph associated with that image. Image processing has two types which are analogue and digital image processing.

In gesture recognition the input images are recognized as a gesture which is depending upon analysis and programming of controller. By applying image at particular axis a selected byte transmitted serially by using MATLAB towards the microcontroller. Microcontroller varies the duty cycle

There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

Zero crossing Detector circuit: Zero crossing detectors are the one type of voltage comparator. We have used

MOC3021 for zero crossing detector circuit. MOC3021 is also called opto-triac.

It is used for isolation between power circuit and AC motor. As the gate of the triac triggered.

The positive and negative voltage get pass through the gate of the triac. By using this method we can control RMS voltage in both directions. There is only need to take care of the firing angle or triggering time. Zero crossing detector gives the reference for providing delay at desired firing angle.

CIRCUIT DIAGRAM:

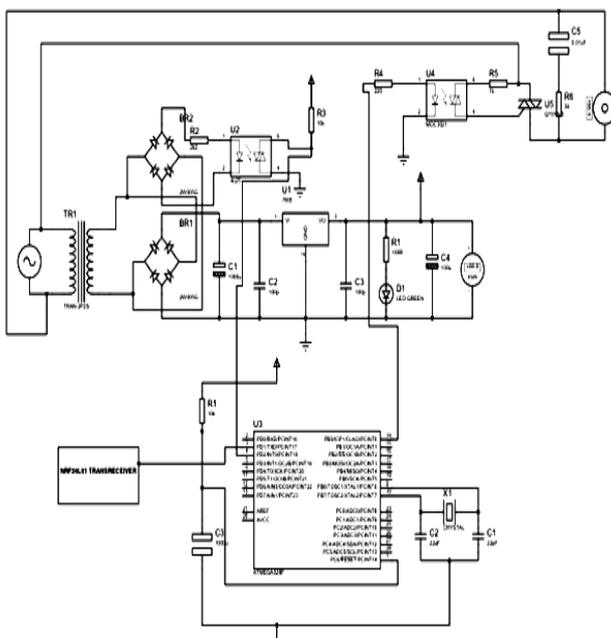


Fig 1. Circuit diagram

CIRCUIT DIAGRAM EXPLANATION

In this system microcontroller 89552 controls the speed of AC motor. As per the name of project gesture base recognition has been recognized by the duty cycle designed by MATLAB. For example the duty cycle is 20ms, 25ms, 30ms, 50ms or 65ms. Ac motor interface with Triac is shown in circuit diagram. Microcontroller operates only with 5V DC supply while AC motor operates on 230V supply. Due to above difference if AC motor is directly connected to

controller the controller might be damage. So here we are using Opto-coupler. As we know AC motor is commonly used appliance it consist of three main parts: Stator winding, Rotor winding, starting mechanism. The starting mechanism provides a start to rotate the motor here we are using zero crossing detector to detect the zero crossing of AC cycle. This information is provided by the micro-controller as per decided duty cycle. Micro-controller varies ON & OFF time or duty cycle. The crystal circuit connected to the controller to get clock pulses at a certain frequency gives a constant voltage by crystal oscillator. There is no need to give any separate voltage. So it takes voltage from that pin again to the gesture recognition with micro-controller. We are using Webcam and MATLAB for gesture recognition system it transmit the data in byte to UART. UART converts collected data from byte to bit and gives to the controller. So the controller selects the designed duty cycle based on the input gesture acquired. Suppose the input gesture acquired is Gesture 1 then 1 transmits to the controller through UART then micro-controller selects duty cycle and rotates the AC motor at a decided speed. If the ON time will be 1ms then controller selects the duty cycle and motor runs at 20% of speed or 300rpm. Micro controller operates the AC motor through triac. The switch of triac is connected between AC power supply and AC motor. The voltage control is done by using triac. Triac is device which operates on both forward and reverse bias. The gate triggering of triac is controlled with the help of micro-controller through auto-coupler. As shown in circuit diagram triac is connected in series with the AC motor. As the micro-controller triggers the gate of triac and the circuit is completed. The benefit of this system is if there is sudden change in firing angle then there will be reduction in mechanical variation. The graph shows the output of triac.

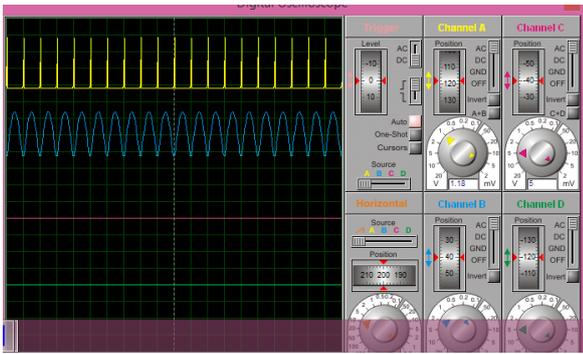


Figure 2. Waveform Of Simulation

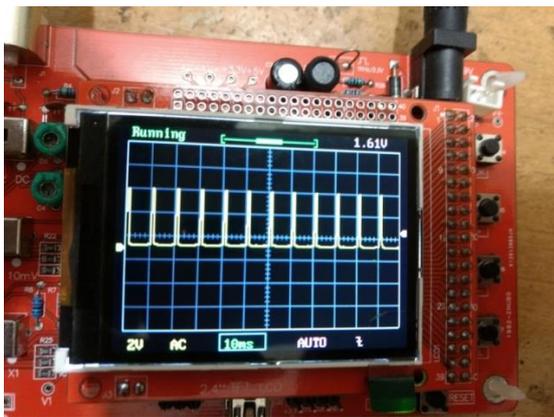


Figure 3. Hardware Based Waveform By Cro

III. DISCUSSION & RESULT

Webcam or camera of laptop will be used for capture the gesture execution. According to gesture performance motor speed varied as shown in table.

Table shows the percentage changes in speed as per time. MATLAB provides the result shown in the webcam and provides to the controller. This result forwarded to the controller through transmitter. Following table shows the results.

Table 1. Results

Time (ms)	AC Motor Speed (%)	AC Motor Speed (rpm)
2.5	25%	375
4	40%	600

5.5	55%	825
6.5	65%	975

IV. CONCLUSION

By this system it is easy to control the speed of motor we can also use this system for home appliances. For physically impaired peoples it is difficult to ON or OFF lights, this system is useful for them. Also in other industrial systems this method we can use. Here, the software provided for gesture reorganisation is MATLAB.

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