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Speed Control of AC Motor Using GSM

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ABSTRACT

GSM (SMS) Controlled AC Motor is automatic control system which capable of receiving a set of command instructions in the form of Short message service(SMS) and performs the necessary actions like Start, Stop and speed control. We have used a dedicated modem/mobile at the receiver module i.e. with the model itself and send the commands using SMS service as per the required actions. The GSM modem which is dedicated at the motor driver is interfaced with an intellectual device called Micro controller so that it takes the responsibility of reading the received commands in the form of SMS from the mobile unit and perform the corresponding predefined tasks such as motor start, stop, motor direction and speed control at different levels. The utilization of GSM modem in this project as it ubiquity standard which enables subscribers to use their phones in many parts of the world, and make international roaming very common between mobile phone operators. This system is extremely handy and convenient to operate at any place for controlling the speed and direction of motor.

Keywords : GSM, AC Motor, Micro-controller.

I. INTRODUCTION

GSM (SMS) Controlled AC Motor is automatic control system which capable of receiving a set of command instructions in the form of short message service and performs the necessary actions like Start, stop and speed control. We will be using a dedicated MODEM/mobile at the receiver module i.e. with the robot itself and send the command using SMS service as per the required actions. The GSM modem which is dedicated at the motor driver is interfaced with an intellectual device called Micro-controller so that it takes the responsibilities of reading the received commands in the form of SMS from the mobile unit and perform the corresponding predefined tasks such as motor start, stop, motor direction and speed control at different levels etc. Speed control of AC motor is based on adjusting voltages which gets to the motor. Speed control has been possible for many decades by adjusting power resisters and adjustable transformers. The problem of speed control has been that they are big, expensive, have poor efficiency and they are hard to control from remote locations. In particular, the high peak to peak current gives poor motor performance and the consequential high brush temperature leading to limited motor lifetime

II. PROJECT OVERVIEW

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

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.

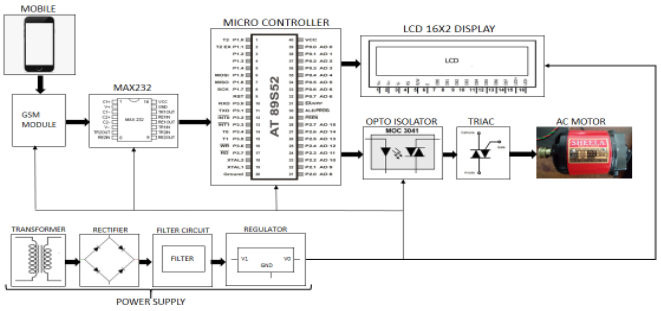

Fig. 1 Block diagram

A. Embedded systems

Embedded systems are a system is which performs a specific or a pre-defined task. It is the combinations of hardware and software. It is nothing but a computer inside a product. It is a programmable hardware design nothing but an electronic chip.

A general-purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant.

B. Micro-Controller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatilememory technology and is compatible with theindustry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

C. GSM Module

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM, the Global System for Mobile communications, is a digital cellular communications system, which has rapidly gained acceptance and market share worldwide, although it was initially developed in a European context. In addition to digital transmission, GSM incorporates many advanced services and features, including ISDN compatibility and worldwide roaming in other GSM networks. This paper will give an overview of the services offered by GSM, Micro-Controller.

D. Opto-coupler

In this project we have an opto-coupler MOC3021 an LED diac type combination. Additionally, while using this IC with microcontroller and one LED can be connected in series with IC LED to indicate when high is given from micro controller such that we can know that current is flowing in internal LED of the opto-IC. When logic high is given current flows through LED from pin 1 to 2. So in this process LED light falls on DIAC causing 6 & 4 to close. During each half cycle current flows through gate, series resistor and through opto-diac for the main thyristor /triac to trigger for the load to operate. The opto-coupler usually found in switch mode power supply circuit in many electronic equipment. It is connected in between the primary and secondary section of power supplies.

E. Triac

TRIAC (triode for alternating current) is a generic trademark for a three terminal electronic component that conducts current in either direction when triggered. Its formal name is bidirectional triode thyristor or bilateral triode thyristor. A thyristor is analogous to a relay in that a small voltage induced current can control a much larger voltage and current. The TRIAC where "A1" is Anode 1, "A2" is Anode 2, and "G" is Gate. Anode 1 and Anode 2 are normally termed Main Terminal 1 (MT1) and Main Terminal 2 (MT2) respectively.

III. WORKING

The speed of the AC motor is controlled using wireless speed controlling technique(GSM) is shown

in Fig.1. Speed control is done by using triac and GSM technology. User can increase and decrease the speed of the AC motor through any mobile. The Microcontroller is programmed using Embedded C language.

This project uses regulated 5V, 500mA power supply,microcontroller, regulator7805, a three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the AC output of 230/12v step down transformer. The command is given to the system through the mobile as SMS. On the other side the control circuitry of motor also contains a GSM module which is used connect with the phone. The GSM modem is connected with microcontroller which is used to decode the command sent by mobile. Microcontroller is then connected with TRIAC circuit, to which the motor is connected. The triac is connected through optoisolator which is used to reduce the effect of high voltages. The regulated power supply is given to the control circuit. At starting the motor is in rest position and by using different commands we can start, stop and vary the speed of the ac motor. The control flow of the circuit is given below Fig.2.

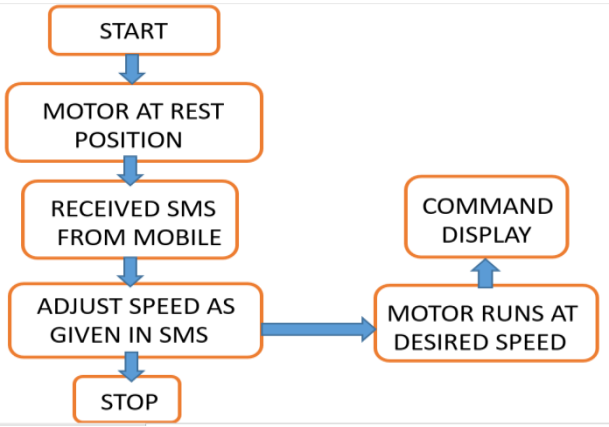

Fig. 2 system flow diagram

The commands which are used for speed control of ac motor are given in table 1.

Table1. Speed of motor for different commands

S.No	Command from Mobile **(clockwise)**	Command from Mobile**(anti clockwise)**	Percentage of speed
1	*c1	*a1	10%
2	*c2	*a2	50%
3	*c3	*a3	75%
4	*c4	*a4	100%
5	*c5	*a5	0%

The graph which shows the performance characteristics of speed control of ac motor using gsm.

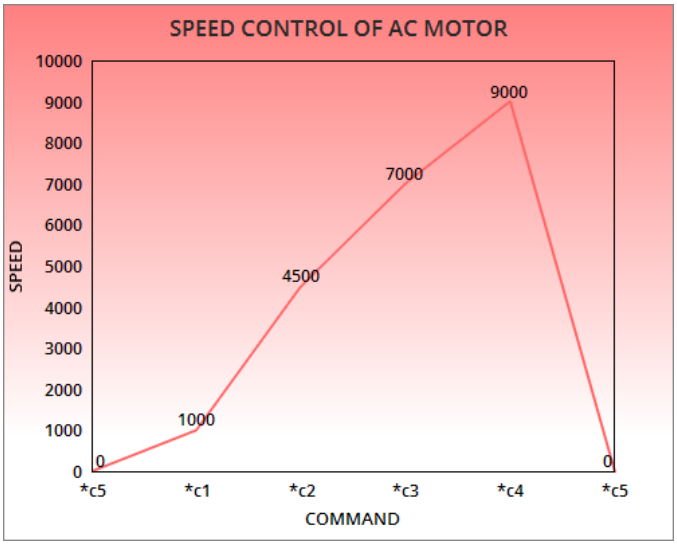

Fig. 3 Graph for different speeds

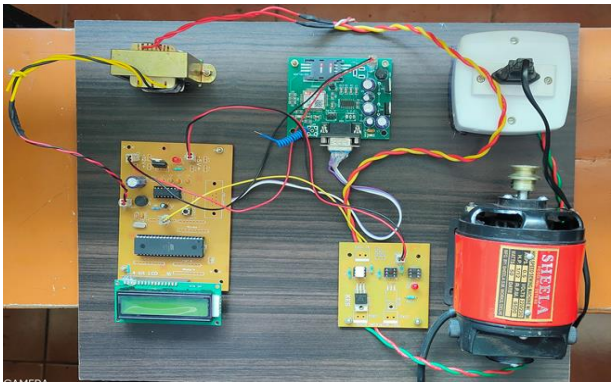

Fig. 4 Actual Model

The above figure(Fig.4) is the actual hardware kit of the project.

IV. EXPERIMENT RESULTS

Fig. 5 (a) speed at command 1

Fig. 5 (b) speed at command 2

Fig. 5 (c) speed at command 3

Fig. 5(d) speed at command 4

V. CONCLUSION

Thus we conclude that we have been able to present a hardware implementation of speed control of AC motor using the GSM module. Using the micro controller, we have developed a hardware setup which is able to control the speed of AC motor. The GSM module along with the Micro-controller, PWM technique controls the speed of an AC Motor. This scheme can be used to drive the motor at the desired speed.

We also conclude that in future, which necessary modification this scheme can be implemented for various other motors and the system can be escalated to work through an android app as well as it can be controlled through the cloud.

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