Embedded Based Monitoring and Control of Parameters in A DC Motor

Preethi.R[1] Dhivya.N[2]
[1]PG Student [2]Assistant Professor
[1,2]Knowledge Institute of Technology, Kakapalayam, Salem

Abstract— This paper describes the automation process, most of the industries are shifted towards automation. In order to do the tedious work and to serve the mankind, automation is developed in industries. In this project the automation work is done in DC motor for monitoring and controlling the parameters of DC motor. In the existing system, the work is done with the help of man power, where every time a person wants to monitor the temperature of the DC motor. If the temperature increases in the coil of DC motor, the machine gets stopped. To avoid this, the cooling fan is turned ON manually. In the proposed system, monitoring and controlling the DC motor was done automatically by using the ARM controller.

Key words: ARM, Temperature sensor, cooling fan, RS 232

I. INTRODUCTION

Now a day's there is advancement in technologies, in order to reduce the man power in industries the industries are shifted towards automation. In the existing system, temperature was monitored manually. If the temperature gets increased to 50 degree the cooling fan was turned ON to maintain the temperature of the coil of DC motor.

In the proposed system, this was done automatically by using the ARM processor. The temperature sensor is used to monitor the temperature of the coil of the DC motor. ARM processor is used to control the process.

The RS232 is used to connect the processor with the PC to store the database of the temperature. The temperature was being monitored using the ARM Processor. The relay is used to control the speed of the cooling fan according to the temperature of the coil of the DC motor.

II. LITERATURE SURVEY

[1].Md.MurshadulHoque describes in this paper the electrical device can able to control the input voltage as well as power. This control is done not only by the manual method but also through the automatic system. In the existing system most of the devices are controlled only though the manual method. In order to get the accurate result the voltage control technique is used to control the power to the electric devices. The output will vary depending on the variations in the surrounding temperature. The relay is connected to regulating coil to control the output voltage as well as power. The proposed system is most reliable and cost effective.

[2].Bogdalevarda describes the temperature control required in industries. In this paper a low cost application for temperature control in ventilation system using the PIC18F4620 was designed and developed. Ventilating is the process of changing or replacing air in any space to control temperature or remove moisture, smoke, dust, unpleasant smells or bacteria. Ventilation in a test room refers both to the exchange of air to the outside as well as circulation of air within a room. In this system implementation of PID controller with PIC18F4620 that offer the zero steady state error if the load disturbances is entered in the room. In this the plant reduces the motor speed and save the power.

[3]Huang wen-tian In this paper the temperature sensor is used to measure the temperature of the motor. The preset value of the temperature is detected and the time is displayed. The monitoring data is printed. The printed data will help to monitor the motor continuously. An alarm will be given to indicate when the temperature is exceeded the normal value. Hence the automation is achieved to monitor the certain temperature range. The microcontroller is used which provides the instructions to all the components in the circuit. This automation system is reliable and accurate.

[4].CH.Mounika describes the control of the DC motor based on the parameters like temperature changes using CAN protocol implementation. The LM35 series are precision integrated circuit temperature sensors, whose output voltage is directly proportional to the Celsius temperature. The temperature changes are measured by the ADC and transmitted to the other node using the CAN Bus and the data is received at the other node based upon the data received the speed of the DC motor is Regulated using the PWM (pulse width Modulation) Technique. This PWM is achieved by on Chip Timers. The motor is connected to a cooling device to control the temperature.

[5]Huichen in this paper describes the temperature of the engine cooling water jacket is measured. The temperature of the water coolant is measured and the result is sent to the electronic control unit. The temperature is displayed in the LCD display. In the existing system the temperature sensor is used to measure the temperature, in order to get the accurate result the automotive temperature sensor is used to measure the temperature. For this the ARM7 and μC/OS are used as a hardware and software. By using this resistance temperature characteristics are measured.

III. PROPOSED SYSTEM

A. *Existing system*

In the existing system the temperature of the coil of the DC motor is monitored manually. The insulating coil is present in the center of the dc motor, if the temperature of the coil gets increased to 50 degree the insulation coil will be damaged and function of the machine will be stopped. For this the cooling fan is turned ON to maintain the temperature.

B. *Proposed System*

In the proposed system the temperature will be monitored and controlled using the temperature sensor. The relay is used to switch on the cooling fan automatically when the temperature is increased. The current and the speed of the DC motor will be calculated. The speed is calculated using U Slot sensor. The current and the voltage can be measured by the pulse generated from the DC motor. The temperature measurement is stored as a database in PC.RS232 is used as

an interfacing with PC and the ARM. The relay is used to control the speed of the cooling fan.

IV. BLOCK DIAGRAM

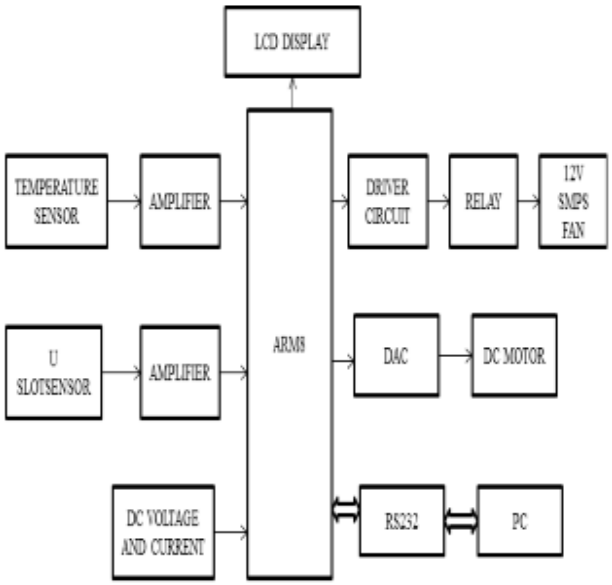

Fig. 1: Block diagram of Automatic Monitor and Control in DC motor.

In this Automatic Monitor and Control in DC motor the temperature of the coil of the DC motor is measured by using the temperature sensor. The signal from the temperature sensor is amplified by using the amplifier. The signal from the amplifier is given to the ARM processor, the processor process the signal. The driver circuit is used to control the components in the circuit. If the temperature of the coil is increased to 50˚ the cooling fan is turned ON. The Uslot sensor is used to measure the speed of the DC motor. The DC voltage and the current of the DC motor are measured from the pulse generated by the DC motor. The RS232 is used as an interfacing unit. PC is used to display the simulation result.

V. HARDWARE DESCRIPTION

A. DC Motor

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

B. Temperature Sensor

A temperature-sensitive resistor is called a thermistor**.** The resistance of most common types of thermistor *decreases* as the temperature rises. They are called negative temperature coefficient**,** thermistors.

A typical negative temperature coefficient thermistor is made using semiconductor metal oxide materials. As the temperature rises, more charge carriers become available and the resistance falls. Although less often used, it is possible to manufacture positive temperature coefficient, thermistors. These are made of different materials and show an increase in resistance with temperature.

C. U Slot sensor

This circuit is designed to monitor the speed of the motor. The holes type pulley is attached in the motor shaft. The pulley is rotated across the USLOT. The USLOT consists of IR transmitter and receiver. Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other.

D. ARM

ARM is a family of instruction set architectures for computer processors based on reduced instruction set computing(RISC) architecture developed by British company ARM Holdings. A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical CISCx86 processors in most personal computers. This approach reduces costs, heat and power use. Such reductions are desirable traits for light, A simpler design facilitates are more efficient in multi-core CPUs and higher core counts at lower cost, providing improved energy efficiency for servers.

E. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism, but other operating principles are also used. Relays find applications where it is necessary to control a circuit by a low-power signal, or where several circuits must be controlled by one signal. Relays found extensive use in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly drive an electric motor is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device triggered by light to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protection relays.

F. LCD

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly. They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube displays in most applications. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they cannot suffer image burn-in.

G. RS232

In telecommunications, RS-232 is a standard for serial binary data interconnection between a DTE (Data terminal equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. The standard does not define such elements as character encoding or the framing of characters in the data stream .The standard does not define protocols for error detection or algorithms for data compression.

VI. FLOWCHART AND ALGORITHM

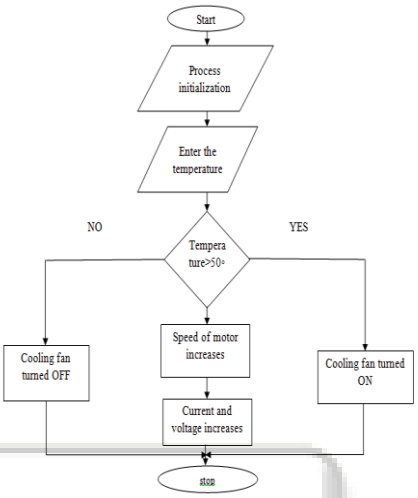

Fig. 2: Flow chart for monitoring and control inn DC motor.

1) Step1: Start the process
2) Step2: To initialize the process
3) Step3: Enter the temperature
4) Step4: If the temperature is greater than 50◦the speed, current and voltage increases
5) Step5: The cooling fan will be turned ON to reduce the temperature
6) Step6: Stop the process

VII. SOFTWARE DESCRIPTION

A. Eclipse (Software)

It's an Integrated Development Environment (IDE) product. Eclipse uses plug-ins to provide all the functionality within and on top of the runtime system. Its runtime system is based on Equinox, an implementation of the OSGi core framework specification. It's to be extended using other programming languages such as C and Python, the plug-in framework allows the Eclipse Platform to work with typesetting languages like Latex, networking applications such as telnet and database management systems. Eclipse is used to create the bin(.BIN) file.

VIII. SIMULATION RESULT

The simulations results are obtained from the ARM processor are as follows

Fig. 3: Status of Cooling Fan

The cooling fan OFF state, this indicates the DC motor is in normal condition. At that time the LCD on the board displays the cooling fan OFF.

Fig. 4: ARM 8 Processor Output

When the cooling fan is turned ON the temperature will be reduced. At that time the LCD in the ARM kit displays the temperature is normal. When the temperature in the coil of the DC motor increases the condition will be abnormal. This will be indicated as abnormal in the LCD display of the ARM kit.

Fig. 5: Status of cooling fan

When the temperature increases the cooling fan will be on automatically turned ON. This is to reduce the temperature of the coil. At that time the LCD in the ARM kit display the cooling fan ON.

IX. CONCLUSION

In this project, the automatic monitor of temperature in DC motor was done and is implemented using the ARM processor. This help to reduce the man power and save the time. In future work, the database will collect and store in PC by using LabVIEW and the graphical representation will be help to monitor the conditions of DC motor.

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