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Fan Speed Controller by using Plus Width Modulation and Temperature Sensor LM35

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ABSTRACT

The temperature is very important for many applications, scientific and engineering fields and more, so was the greatest concern of scientists and engineers, especially in the field of industry and automation to take their attention and design circuits to measurement temperature and control it after the expansion and progress in the automation and control field. This paper presents the idea of temperature control for any device is controlled according to its requirements for any industrial application. It also displays the temperature on the LCD display in the range -50 ° C to + 120 ° C. So that the LM35 temperature device is connected to the Arduino circuit, this, in turn, converts this reading and displays it on the screen. This is a new design to control fan speed based on temperature by using (PWM) technology, it is small and simple circuit that helps control and automate processes where maximum and maximum temperature can be set up as quickly as possible in the Arduino panel. Then Arduino generates output (PWM) on the corresponding digital output according to the measured temperature. The fan speed matches the measured temperature. A standard power supply of 12volt and 5 volts is provided through the regulator. This system works correctly and design is suitable according to laboratory needs, industrial and modern technology.(PWM) technology is suitable for fan speed according to ambient temperature and the results were satisfactory and practical according to schedule.

Keywords— ARDUINO board, temperature: Modulation.

I. INTRODUCTION

In this modern era, technologies are growing better and faster. Everything is getting more sensible and automated. Microcontroller plays very important role in making this smarter. The microcontroller has become the smart developments. It is a single chip microprocessor which helps to control and automate machines and processes. The chip is used to execute the code on the given board. Microcontroller usually consist of Central Processing Unit (CPU), timers and counters, interrupts, memory, input/output ports, analogue to digital converters (ADC) on a single chip. This project presents the output of the fan speed using the Pulse Width Modulation (PWM) on the input 16x2 LCD. A temperature sensor LM35 is used which senses the temperature change and the speed of the fan varies accordingly[1].

II. PULSE WIDTH MODULATION

Pulse Width Modulation (PWM) is a technique where the width of the periodic sequence pulses is varied in accordance with the baseband signal. The leading edge of the pulse is held constantan the change in pulse width with the signal is measured with respect. PWM is also known as Pulse Duration Modulation. The general purpose of Pulse Width Modulation is to control power delivery, especially to inertial electrical devices. The on-off behaviour changes the average power of the signal. Output signal alternates between on and off within a specified period. If signal toggles between on and off, quicker than the load, then the load is not affected by the toggling. A secondary use of PWM is to encode information for transmission. In PWM, the pulse width is proportional to the amplitude of the signal. By varying the duty cycle of the pulse, the speed of the fan can be controlled. The duty cycle may be defined as the amount of time in a particular period during which the pulse is active or high. The speed is made slow, medium, fast, very fast and zero by having different duty cycles. The Duty Cycle is a measure of the time the modulated signal is in its “high” state. It is generally recorded as the percentage of the signal period where the signal is considered on [2].

III. A BLOCK DIAGRAM

The block diagram of the system has been shown in above figure which consists of the following: Temperature sensor: The LM35 is a precision IC temperature sensor, whose output voltage is proportional to the temperature in Celsius. The LM35 sensor is interfaced with the microcontroller to measure the temperature. Arduino: Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, and turn it into an output, active a motor, turning on an LED, publishing something online[3]. FAN: It is the output part of our project. The speed of the fan varies according to the change in temperature.

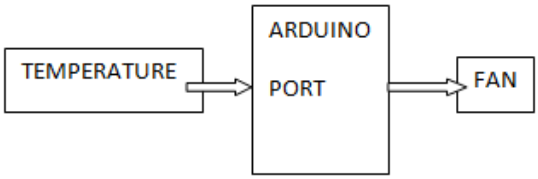

Figure 1, Block Diagram of system

Five volts power supply with respect to ground is needed for the operation of the microcontroller and 12V power supply is needed to the fan. The power supply consists of a step down transformer which is used to convert 230V, 50Hz AC voltage to 12V AC, 50Hz. This 12V AC voltage is given to the bridge rectifier, which converts it into 12V DC. A voltage regulator 7805 is used to convert the 12V DC into 5V DC which is needed by the microcontroller.[4]

Capacitors are used for smoothening the output voltage. These five volts dc thus produced is given to the microcontroller for its operation. From the power supply, two different voltages are generated from the voltage regulators. One is 12 volt generated by the 7812 voltage regulator. This supply goes to the fan. Another is 5 volts generated by the 7805 voltage regulator. This supply goes to the LCD and Arduino board [5].

IIV. RESULT

The simulation of the system has been done on Arduino Software v1.0.6. An Arduino board is used in this project. ATmega328P microcontroller is used on the Arduino board. Coding of the system has been done in Embedded C language. 16X2 LCD display has been used which connected to pins 2, 3, 4, 5, 9, 11 and 12 of the Arduino board. The temperature sensor LM-35 senses the room temperature and it is displayed on the LCD. [6]The fan speed is controlled by using PWM technique according to the room temperature. The temperature sensor LM-35 interfaced to the A1 port of the Arduino board which acquires the room temperature. And the signal is converted into digital voltage signal. The microcontroller used in this system has inbuilt PWM module which is used to control the speed of the fan by varying the duty cycle.[7] According to the readings from the temperature sensor fan speed is varied automatically. Table 1 shows the speed of the fan varying with the temperature.

Table 1: Temperature and Fan speed

N	Temperature *C	Fan Speed
1	30	0 %
2	40	25%
3	50	50%
4	60	75%
5	70	100%

Set a range of 30℃ to 70℃ in the board so at the temperature below 30℃. The rise in temperature and the speed of the fan are directly proportional, as the temperature increases the fan speed also increases correspondingly. At 30℃ and below temperature, the fan speed is 0% and when the temperature increases from 30℃, the speed of the fan increase from 0%. The speed of the fan reaches 100% when the temperature reaches 70℃.

The fan speed has been controlled by using PWM technique according to room temperature. The simulation of the system has been done on Arduino software v1.0.6 and it is running in good agreement. The logic used in the system is verified. Therefore fan speed is varied according to room temperature. The design of the system presented in this paper is appropriate according to the modern technology.

IVI. CONCLUSION

This design used to control the fan speed based on temperature using PWM technique is proposed. The simulation of the system is working properly and the design is appropriate according to the modern

needs and technology. The fan speed depends on the surrounding temperature and there is no need for regulating the speed manually. A table has been given to show the relationship between the change in temperature and the increasing in the speed of the fan. Found PWM technique is suitable for controlling fan speed according to change in surrounding temperature. This design can be further extended in terms of area and power at the layout and characteristic level by using Advanced VLSI applications.

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