NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

Course : Microprocessor and Microcontroller Lab.

A Mini Project Report on

TEMPERATURE CONTROLLED DC FAN USING 8051 MICROCONTROLLER

Submitted By

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ABSTARCT

The project is Temperature Controlled DC Fan.The main aim of this project is to monitor the surrounding temperature and change the speed of the fan according to the temperature changes i.e. the speed should increase with a rise in temperature and should decrease with a drop in temperature. The temperature would be displayed through the LCD which is interfaced with the 8051 microcontroller. The FAN is controlled by a PWM wave given to it by the microcontroller, the power given to the fan is lesser in low temperature and greater in high temperature.By controlling the speed of the fan at different temperature's we save a lot of energy throughout the day. Instead of a fan running at full speed all day which requires a lot of energy, if the speed is controlled and given as necessary we can save a lot of energy.The main principle behind the working is PWM i.e. pulse width modulation. It is a technique for controlling the power output given to different electric devices.

Signed copy of the approved objectives by the guide:

Microprocessor and Microcontroller Application Lab. (19EC507)

Mini Project Title:

Temperature Controlled Fan

By

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Section: 5D

Abstract:

The main aim of this project is to calculate and monitor the surrounding temperature and change the speed of the fan as temperature changes i.e. the speed should increase with a rise in temperature and should decrease with a drop in temperature. The temperature would be displayed through the LCD which is interfaced by the 8051 microcontroller. The FAN is controlled by a PWM wave given to it by the microcontroller, the power given to the fan is lesser in low temperature and greater in high temperature. By controlling the speed of the fan at different temperature's we save a lot of energy throughout the day. Instead of a fan running at full speed all day which requires a lot of energy, if the speed is controlled and given as necessary we can save a lot of energy.

Objectives:

a) First objective is to sense the surrounding temperature. LM35 is the sensor used to sense the temperature.LM35 is a type of commonly used temperature sensor, that can be used to measure temperature with an electrical output comparative to the temperature in (°C).

Title and objectives are approved by

Ramya

(Signature)

Name :

Designation :

Remarks if any by External Examiners during SEE

	Name	Signature
Examiner 1		
Examiner 2		

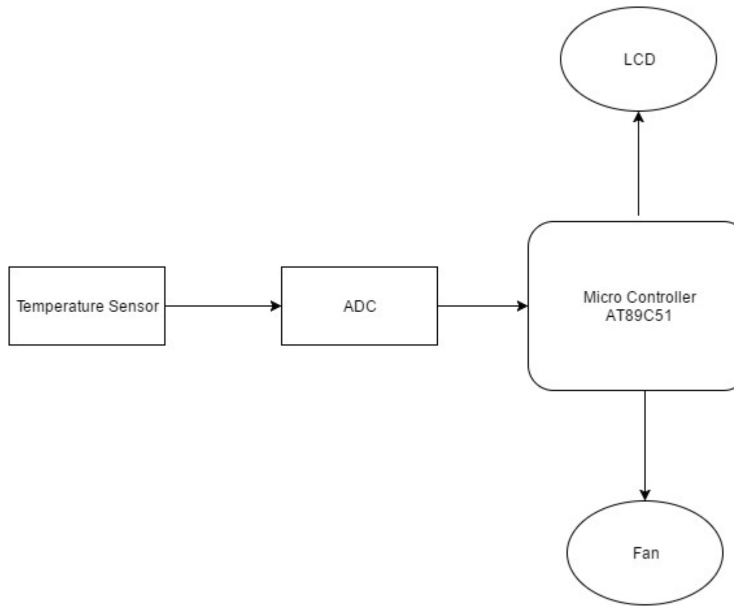
II. OBJECTIVES OF THE PROJECT

a.Sense the temperature.

b. Display the temperature.

c. Vary the fan speed according to the temperature.

III.BLOCK DIAGRAM



The temperature sensor senses the surrounding temperature which is in analog form. Microcontroller is not able to process this analog signal .Thus the analog voltage is given to ADC which gives digital signal as output,which can be fed to the microcontroller. After processing the temperature value is displayed on the LCD , based on the sensed value of temperature the speed of the fan is varied.

IV. Method

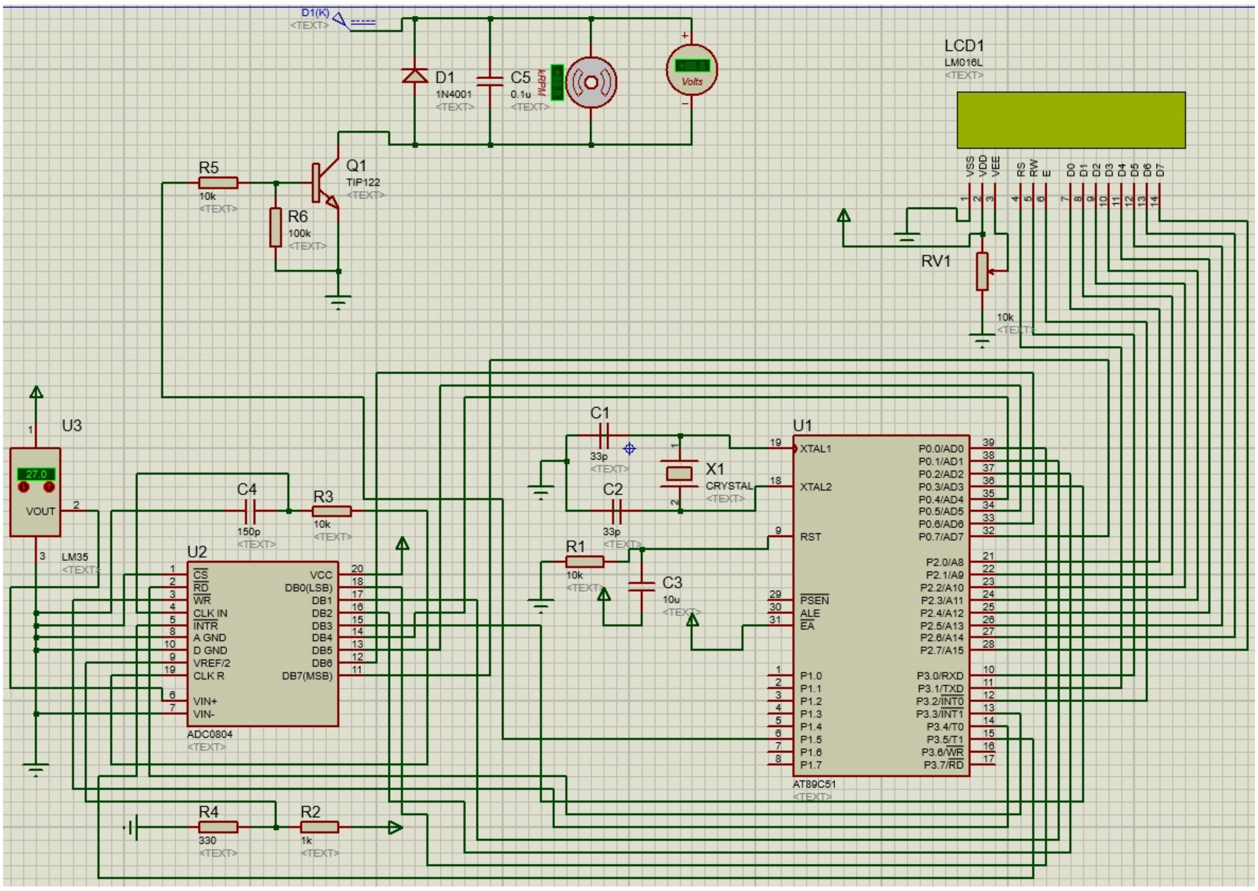


Figure: Circuit diagram

a. **Sense the temperature**

First objective is to sense the surrounding temperature. LM35 is the sensor used to sense the temperature. LM35 is a type of commonly used temperature sensor, that can be used to measure temperature with an electrical output comparative to the temperature in (°C). It can measure temperature in a better way then thermistor.LM35 is used in industries and commercial buildings where high accuracy of temperature measuring is needed. The sensor will perform sensing when the temperature changes every 1ºC temperature will show a voltage of 10 mV. One of the most important characteristic is that it draws just 60 microamps from its supply and acquires a low self-heating capacity.

LM35 has three pinouts which are:

PIN 1: Vcc, it used as input at this pin we apply +5 V input voltage.

PIN 2: At this pin, we get output voltage.

PIN 3: This pin is used for ground.

LM35 looks like a transistor it gives us the temperature in Celsius in terms of millivolt. For example if the temperature is 25°C its output will give us 0.25V provided we supply at least 1V to it.

Fig:LM35 Temp. sensor

b.Display the temperature

The output of the LM35 sensor which is in the analog form is given into anlog to digital converter.
Analog-to-Digital Converter (ADC) is a device that converts a continuous physical quantity (usually voltage) to a digital number that represents the quantity's amplitude.The conversion involves quantization of the input, so it necessarily introduces a small amount of error. Instead of doing a single conversion, an ADC often performs the conversions ("samples" the input) periodically. The result is a sequence of digital values that have converted a continuous-time and continuous-amplitude analog signal to a discrete-time and discrete-amplitude digital signal.

Based on the value given by ADC, microcontoller display the value on the LCD.Port 2 of the AT89S52 microcontroller is connected to the data pins of the 16×2 LCD. Port 0 of AT89S52 is connected to the data pins of ADC0804. Enable pin of the 16×2 LCD is connected to port 3 pin 7. RS (register select) pin is connected to port 3 pin 5. RW(read write) pin is connected to port 3 pin 6.

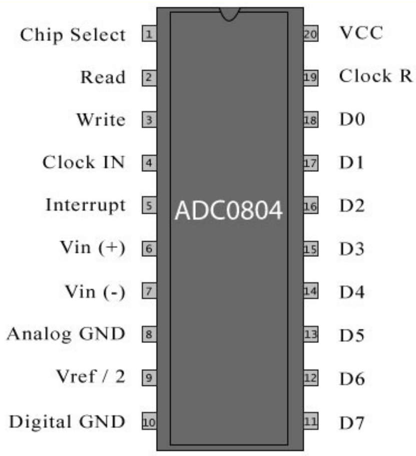


Fig1:ADC0804

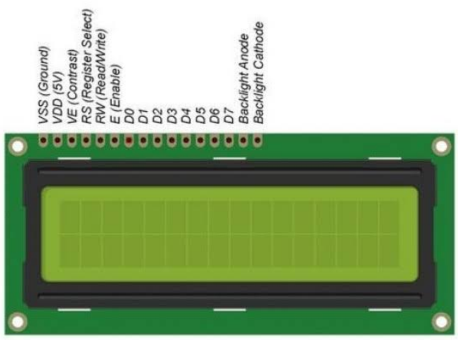
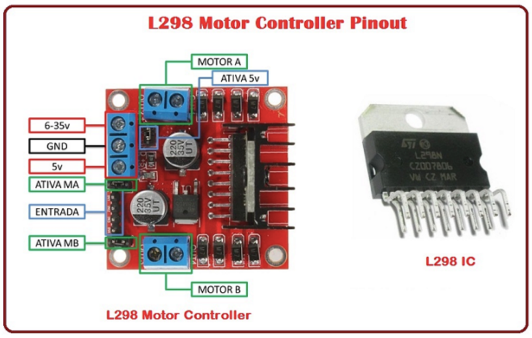


Fig2:16x2 LCD

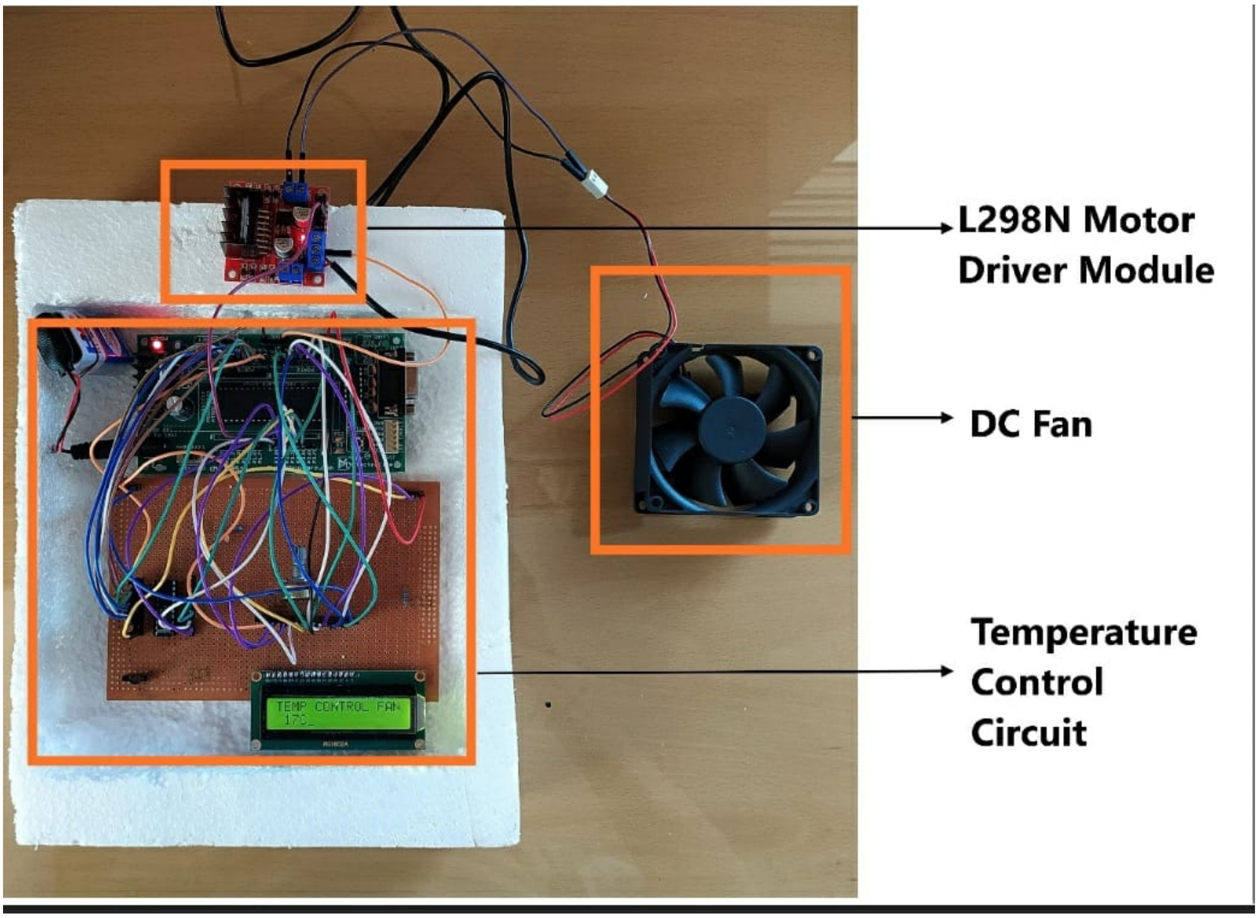
c.Vary the fan speed acording to the temperature:

The third objective of this project is to vary the fan speed according to the temperature. Based on the temperature sensed by the LM35, we are going to control speed of the DC fan ,which depends on the technique called Pulse-width modulation (PWM) or duty-cycle variation methods.They are commonly used in speed control of DC motors. The duty cycle is defined as the percentage of digital ‘high’ to digital ‘low’ plus digital ‘high’ pulse-width during a PWM period. As the width varies, the delay varies as a result of that the speed of the fan varies accordingly.In this project the pin P1.5 of the AT89S52 microcontroller is used to provide PWM. This pin is connected to the L298N motor driver which is in turn connected to the DC fan.The fan is in off state below a temperature of 25°C. Once the temperature crosses this value the fan turns on and runs with a slow speed.Once a temperature of 45°C is reached, there is a increase in the fan speed.



V. Result

Experimental setup



Discussion:

As we have seen that the fan speed changes according to the temperature therefore, we can say that we can save the energy accordingly. And when the fan runs slowly it consumes less energy as compared to when at the higher speed. Thus, we can make a temperature controlled DC fan by using a microcontroller and ADC. The speed of this type of fan is controlled by the surrounding temperature and accordingly only some amount of energy is used and enough energy is saved.

Code snippet

```
ORG 0000H
LJMP MAIN

ORG 000BH
LJMP INTERRUPT

ORG 0030H
MAIN:
MOV P0, #0FFH
SETB P1.5
MOV A,#38H
ACALL COMMAND
ACALL DELAY
MOV A,#0EH
ACALL COMMAND
ACALL DELAY
MOV A,#01H
ACALL COMMAND
ACALL DELAY
MOV A,#080H
ACALL COMMAND
ACALL DELAY
LJMP AGAIN1

COMMAND:
MOV P2,A
CLR P3.7
CLR P3.6
SETB P3.5
ACALL DELAY
CLR P3.5
RET

DELAY:
MOV R3,#0FFH
AGAIN : DJNZ R3,AGAIN
RET

AGAIN1:
MOV A,#' '
ACALL LCDWRITE
ACALL DELAY
MOV A,#'M'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'I'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'C'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'R'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'O'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'C'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'O'
ACALL LCDWRITE
```

```
MOV A,#'T'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'R'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'O'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'L'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'L'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'E'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'R'
ACALL LCDWRITE
ACALL DELAY
MOV A,#0C1H
ACALL COMMAND
ACALL DELAY
MOV A,#'P'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'R'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'O'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'J'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'E'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'C'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'T'
ACALL LCDWRITE
ACALL DELAY
ACALL DELAY1
MOV A,#01H
ACALL COMMAND
ACALL DELAY
MOV A,#' '
ACALL LCDWRITE
ACALL DELAY
MOV A,#'T'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'E'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'M'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'P'
ACALL LCDWRITE
ACALL DELAY
```

```
MOV A,#' '
ACALL LCDWRITE
ACALL DELAY
MOV A,#'C'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'O'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'N'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'T'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'R'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'O'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'L'
ACALL LCDWRITE
ACALL DELAY
MOV A,#' '
ACALL LCDWRITE
ACALL DELAY
MOV A,#'F'
ACALL LCDWRITE
ACALL DELAY
MOV A,#'A'
ACALL LCDWRITE
```

```
ACALL DELAY
MOV A,#'N'
ACALL LCDWRITE
ACALL DELAY
LJMP AGAIN2

LCDWRITE:
MOV P2,A
SETB P3.7
CLR P3.6
SETB P3.5
ACALL DELAY
CLR P3.5
RET

DELAY1:
MOV R3,#0FFH
HERE1: MOV R5,#0FFH
HERE2: MOV 75H,#02FH
HERE3: DJNZ 75H,HERE3
HERE4: DJNZ R5,HERE2
DJNZ R3,HERE1
RET

AGAIN2:
SETB P1.2
SETB P1.0
CLR P1.1
SETB P1.1
HERE5: JB P1.2,HERE5
CLR P1.0
MOV A,#0C1H
```

```
ACALL COMMAND
ACALL DELAY
MOV TMOD,#02H
MOV IE,#82H
MOV R1,P0
MOV A,R1
MOV R4,A
ACALL COMPARE
MOV A,R4
LCALL CONVERSION
LCALL LCDWRITETMP
ACALL DELAY1
LJMP MAIN

COMPARE:
CLR C
CJNE R1,#35,GAIN
GAIN: JNC GAIN1
CLR C
CJNE R1,#25,GAIN2
GAIN2: JNC GAIN3
CLR TR0
LJMP GAIN4
GAIN1: ACALL GREATER
LJMP GAIN4
GAIN3: ACALL LOWER
GAIN4: CLR C
RET

GREATER:
CLR TR0
MOV R2,#0AAH
```

```
MOV TH0,#1FH
SETB TR0
RET

CONVERSION:
MOV B,#10
DIV AB
MOV R7,B
MOV B,#10
DIV AB
MOV R6,B
 MOV A,R6
ADD A,#30H
MOV R6,A
MOV A,R7
ADD A,#30H
MOV R7,A
RET

LCDWRITETMP:
MOV A,R6
ACALL LCDWRITE
ACALL DELAY
MOV A,R7
ACALL LCDWRITE
ACALL DELAY
MOV A,#'C'
ACALL LCDWRITE
ACALL DELAY
RET
```

```
INTERRUPT:
CPL P1.5
CLR TR0
MOV 76H,R2
HERER: DJNZ 76H,HERER
SETB TR0
CPL P1.5
RETI

END
```

Conclusion:

The system develeped here is efficient and power saving. The result depends on the temperature. The fan rotates at higher speed at higher temperatue, by controlling the speed of the fan we can save the energy, instead of running the fan at full speed even at lower temperatures, reduction in power consumption can be done. This can be implemented where the consumption of power has to be controleed like institutes, organizations, firms, computers even for home applications. Furthermore, this project can be enhanced by interfacing with the air conditioners.

Thus, this is all about the temperature controlled fan using microcontroller.