Temperature Based Fan Speed Control

Dr K.S. Tiwari, Madhur Bagwe, Harshawardhan Patil
MES College of Engineering, Electronics and Telecommunication Department, PPU University, Pune, Maharashtra, India

Abstract—Our main purpose for this project is to save energy but it cannot be achieved using old orthodox ways. Automation is the next big thing and we all are steadily moving towards it. Home automation saves energy on large scale. It includes automation of fan, ambient lighting, kitchen appliances etc. In this project we have used LM35, Arduino UNO as our major components to help automate. Our first stage of the project includes the automation of the fan using Arduino UNO where we use LM35 Sensor as temperature input. In second stage we interface light and ultrasonic sensor which helps in detecting objects in the surrounding and executes the changes accordingly with Arduino UNO.

***Keywords*—Fan speed control, Arduino, LM35 Temperature sensor, Ultrasonic sensor, LCD (Liquid crystal display)**

I.INTRODUCTION

Electric fan is a device which moves the air in the room. Fan doesn't cool the surrounding air as compared to air conditioners it can only move the air at varying speeds. In household during summer AC is responsible for 30% to 40% of electricity bill. In some areas there is electricity shortage and hence using energy efficiently is a need of an hour. The world is moving towards automation as it is next big change humanity needs. The old orthodox way to change speed of fan is that we go towards switch or regulator and change the speed of fan and sometimes fan is left at full speed which leads to energy loss & it ultimately leads to more electricity consumption but our project totally changes the old way as the speed of fan changes according to the temperature of the surrounding. Automation of fan changes the fan speed automatically moreover it is also energy efficient as the method used is PWM technique to control the fan thus we don't have to worry about abnormal change in temperature and discomfort caused by it to patients, disabled people etc.

II.PROBLEM STATEMENT

The main idea of this project is to save each unit possible as it is said "one unit saved is one unit generated ". One of the methods to save energy is automating fan thus the main requirement are as follows

- Using PWM (Pulse Width Modulation) technique to control the voltage
- Using LM35 Sensor for temperature sensing and input for the system.
- Using Ultrasonic sensor to detect people in the room and make changes in speed accordingly

DESIGN OVERVIEW

The project is divided in two parts

- Fan speed control using LM35 and Arduino UNO
- Fan speed control using LM35 and Ultrasonic sensor with Arduino UNO/Node MCU (For connectivity)

We are still in stage 1 of project which controls the fan speed solely on the temperature input given by temperature sensor LM35.

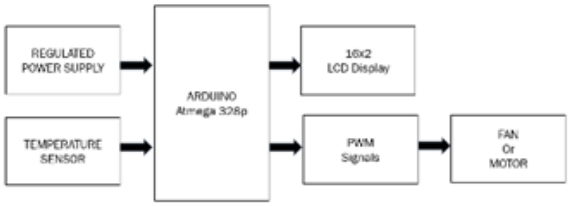


Fig 1.1 Block Diagram of stage 1

Regulated Power Supply

We use 9V DC battery as our power supply for the prototype.

Temperature Sensor

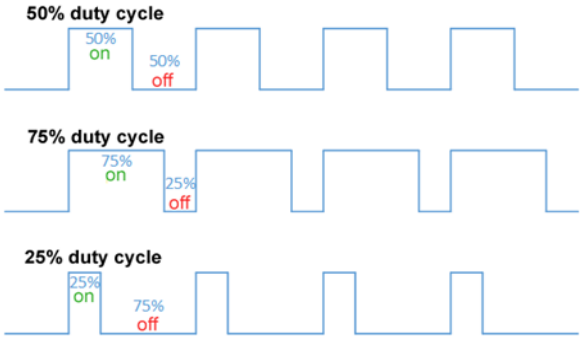
We use LM35 temperature sensor in this project. It detects the surrounding temperature which is given as input to Arduino. The output of LM35 varies linearly with the change in temperature.

Arduino UNO

Arduino UNO consist of microcontroller ATMEGA328P which is heart of the system. Output of LM35 is given to the Arduino board which then compares the reference temperature set and output temperature sensed by LM35. If the temperature is below the reference temperature, then the fan speed will decrease and if the temperature is more than reference temperature then it will increase the fan speed. It is done using PWM technique.

PWM (Pulse Width Modulation)

Pulse Width Modulation, or PWM, is a technique for getting analog results with digital means. Digital control is used to create a square wave, a signal switched between on and off. This on-off pattern can simulate voltages in between full on (5 Volts) and off (0 Volts) by changing the portion of the time the signal spends on versus the time that the signal spends off. The duration of "on time" is called the pulse width. To get varying analog values, we change, or modulate, that pulse width. If we repeat this on-off pattern fast enough with an LED for example, the result is as if the signal is a steady voltage between 0 and 5v controlling the brightness of the LED. In our project PWM controls the voltage supplied to the fan and makes the fan energy efficient.



LIQUID CRYSTAL DISPLAY

Liquid crystal display is kind of flat panel display, it is 16 x 2 display is utilized. now 16 means that it can represent 16 x 2 character in one line and there is 2 such lines in the LCD. the output is displayed on the LCD. It is designed specifically to be used with the microcontroller. LCD displays the room temperature.

ULTRASONIC SENSOR

In this project, Ultrasonic sensor is used to detect the people in the room or surrounding. Using ultrasonic sensor is the second stage of the project wherein we use it to detect the people in the room and then change the speed according to the input given by both sensor and temperature sensor.

	LM35 temperature sensor	Ultrasonic sensor	Fan speed
1	10-26 ºC	1 person	25%
2	26-35 ºC	2 people	50%
3	36-45 ºC	3 people	75%
4	T>46 ºC	4 People	100%

These are the ideal conditions for our project. The second stage is yet to be implemented. The conditions will be A or B instead of A & B to ensure the comfort of the user also with comfort it will also ensure that there is no wastage of energy. The Fan will automatically switch off if the ultrasonic sensor doesn't detect anyone in the room.

FAN

In the prototype we use 12V DC fan. Fan's speed will vary according to the conditions. In practical life we can implement this idea in the table fan as well as in laptop or ceiling fans etc.

IV. COMPONENTS

Arduino Uno	-
Capacitor	10µF, 16V electrolytic
LM35 temperature sensor	-
Resistors	100 Ω ,10kΩ ,100kΩ ,4.7K Ω
Diode	1N4007
MOSFET	-
LCD	16*2
Buzzer	-
Fan	12v DC

ALGORITHM

Set t=0,then fanSpeed=0 and led=off

t=getTemp() // Get current temperature from temperature sensor (i.e., LM 35). Now compare the value of T with range of temperatures and set the fanSpeed according to that

a. if 10<t<26 ºC and t fanSpeed 25%

b. if 26<t<35 ºC and t fanSpeed 50%

c. if 36<t<45 ºC and t fanSpeed 75%

d. if t>45 ºC fanSpeed 100%.

End

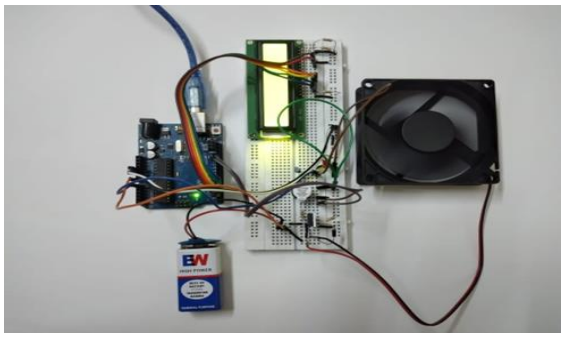


Fig 1.2 Working Prototype of stage 1

Here while recording the prototype temperature was 38 ºC thus making the fan rotate at 100% speed.

V.CONCLUSION

Implementing the smart fan definitely will be energy efficient and user friendly but it also needs a reference temperature to compare and do the necessary changes which can be a bit of process. Sometimes a user may want fan at full speed but according to the program fan speed may be at 75% or lower. There is a need to keep manual access using remote or app meaning that we can't automate fan fully yet. Situating the bulky is a bit of problem in itself thus limiting the use of system to a table fan or Computer unless we make a fancy solution for modern houses. Automating is also costly but one time investment.

VI.FUTURE WORK

We can interface LEDs in the system and a ultrasonic sensor to the fan taking a step towards home automation. Instead of Arduino Uno we can use NodeMCU which has ESP series microcontroller and has Wi-Fi connectivity thus making it a IoT content. Using LEDs in prototype as a representative of ambient lighting which also depends upon mood, manual setting or automatically.

VII.ACKNOWLEDGMENT

This project is made under the guidance of Dr K.S.Tiwari and other contributors from MES college of Engineering SPPU University, Pune.

REFERENCE

[1] Microcontroller based Automated Room Light and Fan Controller Pritam Roy, Jui Saha, Nikkon Dutta, Sayani Chandra.

[2] Speed control of ceiling fan using PWM technique

[3] Shivesh . Rishabh Mishra,and Dr. E.Annie Elisabeth.

[4] Automatic room temperature control system using Arduino.

[5] Guru M. Debele, Xiao Qian.

[6] Automatic Speed Control and Turning ON/OFF for Smart Fan by Temperature and Ultrasonic Sensor Keeratiburt Kanchanasatian.

[7] Temperature Based Speed Control of Fan Using Arduino Shwetha S Baligar1 , Srinidhi S Joshi2 , Sujay Mudhole3 , Spoorti S Jadhav4 , Chaitanya K Jambotkar5 1,2,3,4 4 th SEM Student in Department of Electrical and Electronics Engineering, K.L.E.I.T, Hubli, Karnataka, India 5 Assistant Professor in Department of Electrical and Electronics Engineering, K.L.E.I.T, Hubli, Karnataka, India

[8] Microcontroller based Automated Room Light and Fan Controller. Pritam Roy, Jui Saha, Nikkon Dutta, Sayani Chandra Dept. of Computer Science & Engineering Guru Nanak Institute of Technology. Kolkata, India.