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Automatic Fan Speed Control using Temperature and Humidity Sensor and Arduino

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ABSTRACT

The Study is aimed at controlling the speed of the fan automatically using Arduino, temperature, and humidity sensors. Fan speed needs to be manually controlled every time but by using this idea the speed of the fan will be automatically adjusted according to the surrounding environment. The project is based on the concept of the Internet of Things(IOT). A simple strategy to automatically control the speed of fan using DHT22 sensor. According to the temperature sensed by temperature and humidity sensor the resistance of the fan will be adjusted to change the fan speed. It's fairly straightforward to use, however, needs a careful arrangement to grab information. DHT22, Arduino, and LCD will get power from the same fan connection, so that less battery power is used. The temperature will automatically control. In the proposed system Fan can be set at rather high for lowered activity level that required limited body movement like sleeping and sitting. DHT22 sensor is used to sense the temperature and then the speed of the fan is adjusted accordingly using PWM. Here Arduino code is used. In this proposed system, it takes comparatively less time to process. It requires additional devices, external clock and for programming, it requires development system.

Keyword: *IOT, DHT22 Sensor, Arduino Code, Battery, PWM.*

1. INTRODUCTION

Fan speed needs to be manually controlled every time but by using this idea the speed of the fan will be automatically adjusted according to the surrounding. The project is working on the concept of IOT. Here, the temperature is to be controlled and the focus is on the reason of installing automatic controlled Fan is the comfort of the consumer. Temperature is controlled using DHT22 sensors. The DHT22 is an elementary, low-cost digital temperature sensor. It uses an electrical phenomenon and a semiconductor device to live the encompassing air and spits out a digital signal on the information pin. It is easy to use, but requires more time to grab information and then the DHT22 sensor sends the data to the micro-controller circuit which consist of Arduino board. Arduino refers to an open-source electronics board and it is programmed using the software. It makes the electronic design more accessible for anyone interested in creating it with suitable environments.

After the sensor will sense the temperature and the fan speed will be controlled using the Pulse Width Modulation and Arduino board, then the Lcd will display the result that what is the temperature and the speed of the fan. LCD is a device used for the purpose

of displaying. As the name is Liquid Crystal device is uses Liquid crystals and it does not emit light-waves directly, instead of using a reflector to produce footage in colour.

The temperature will automatically control according to the need of the person in that room or particular place since the human body has a higher a higher metabolism during day time and requires more cooling and at night time the body requires less cooling as compared to day time.

2. EXISTING SYSTEMS AND ITS DRAWBACKS

a. Existing System

Some of the existing systems are:

- Development of a system to control air conditioner's airflow for spot cooling (ICE2T 2017)
- Controlling the operating conditions in an operating room (ISEP 2014)
- Design of small smart home system based in Arduino (EECCIS 2014)
- Real-time based temperature control using Arduino (IJIET 2017)

b. Drawbacks of Existing System

- The problem faced during this research is using multiple ultrasonic sensors in the same environment. Multiple sensors operational at the same time initiate interference, one sensor can receive information sent by another sensor.
- It takes comparatively more time to process.
- It requires many devices for operation.
- There is need for external clock.
- Development system is required for programming.
- Circuit size becomes wide.
- Programming Control Block making becomes complex, difficult and heavy.

3. PULSE WIDTH MODULATION

Pulse Width Modulation is a way where the width of cyclic sequence pluses with changed according to the baseband signal. The forefront of the pulse is constant and also the change in pulse width with the signal is measured with respect. PWM is additionally called Pulse Duration Modulation. The purpose of Pulse Width Modulation is to manage power delivery, particularly to mechanical-electrical devices. The on-off behavior changes the typical power of the signal. Output signal alternates between on and off among a specific amount of time. when signal switches between on and off, faster than the load, then the load isn't overdone with the switching. Another use of PWM is to cipher data for transmission. In PWM, the pulse width is proportional to the amplitude of the signal. By changing the duty cycle of the pulse, the speed of the fan will be controlled. The duty cycle can be outlined because the quantity of your time in a very explicit amount throughout that the pulse is active or high. The speed is formed slow, medium, fast, in no time and 0 by having totally different duty cycles.

4. SYSTEM ARCHITECTURE AND DESCRIPTION

This part covers the architecture modules and the architecture is shown in fig1.

a. **Power Source**
   This is the first module which is going to give power all the other modules i.e. Temperature sensor, Arduino, Lcd, Fan.
b. **Temperature Sensor(DHT22)**
   This is another module which will be detecting the temperature and will pass the values of temperature to microcontroller and Arduino.
c. **Arduino Board and Microcontroller**
   This module will be controlling the speed of the fan based on the room temperature sensed by the sensor with the help of the code done in Arduino board.
d. **Lcd**
   This module will be displaying the speed of fan-like zero, slow, medium, fast, very fast.
e. **Fan**
   This module is to be controlled using all the other modules

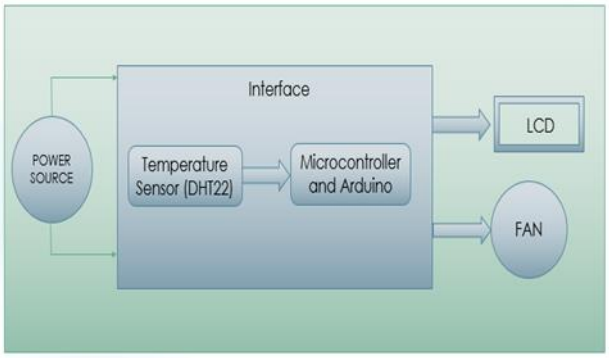

Fig 1: Architecture Diagram

5. SYSTEM MODULES

a. Arduino Programming

Arduino refers to an open-source electronics board and it is programmed using the software. It makes the electronic design more accessible for anyone interested in creating it with suitable environments. The Arduino compiler accepts the languages like as C and C++. In fact, several of the libraries are written in C++. A lot of the underlying system is not object-oriented, but it could be. That's why "The Arduino language" is C++ or C.

Algorithm used for fan speed:

1. Set T=0 and fanSpeed=0

2. T=getTemp ()

3. Now compare the value of T with range of temperatures and set the fanSpeed according to that

a) if T <0C

fanSpeed = 0% //Zero

b) if T =>0C and T <=10C

fanSpeed = 25% //Slow

c) if T>10C and T <=20C

fanSpeed = 50% //Medium

d) if T>20C and T <=30C

fanSpeed = 75% //Fast

c) if T>30C and T <=40C

fanSpeed = 100% //Very Fast

f) if T >40C

fanSpeed = 100% //Very Fast

4. End

b. DHT22 Sensor for getting atmosphere temperature

The DHT22 is an elementary, low-cost digital temperature sensor. It uses an electrical phenomenon and a semiconductor device to live the encompassing air, and spits out a digital signal on the information pin. It is fairly simple to use, but requires more timing to get data. The best thing of this sensor is you can only get new data from it after every 2 seconds, so when using library, sensor readings can be made up to 2 seconds old.

c. Liquid-crystal display for displaying output

LCD is a device used for the purpose of displaying. As the name is Liquid Crystal device is uses Liquid crystals and it does not emit light-waves directly, instead of using a reflector to produce footage in colour. It connects from the sensor and Arduino board. It will show the output. Fig 2 shows how LCD looks like.

Fig 2: Liquid-crystal display

d. Fan speed will be controlled

A fan is a device used to generate a flow of air. The fan made an arrangement of blades which generates the flow of air. The arrangement of blades and hub which is rotating is called as an impeller. Generally, it is contained within the form of housing or some case. This will change the airflow and will increase the safety by preventing objects from contacting the fan blades. Fans are generally powered by electrical motors. In our project basically, the fan speed will be controlled.

6. SYSTEM IMPLEMENTATION

Fan speed needs to be manually controlled every time but by using this idea the speed of the fan will be automatically adjusted according to the surrounding. Temperature is controlled using DHT22 sensors. DHT22 sensor is used to sense the temperature and then speed of the fan is adjusted respectively using PWM (Pulse with Modulation) Then the DHT22 sensor sends the data to the micro-controller circuit which consist of Arduino board. After the sensor will sense the temperature and the fan speed will be controlled using the Pulse Width Modulation and Arduino board, then the Lcd will display the result that what is the temperature and the speed of the fan. The work flow is shown is fig 3.

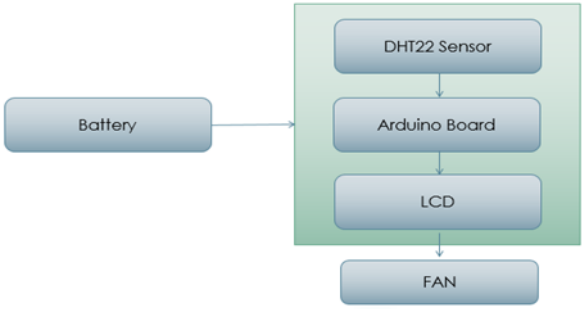

Fig3: Work Flow

7. EXPERIMENTAL RESULTS AND EVALUATION

The temperature and humidity sensor senses the temperature and the data is displayed on the LCD. The speed of the fan is controlled by PWM technique according to the temperature sensed. process analog signals using a digital converter.

The microcontroller used has inbuilt Pulse Width Modulation module which is used to control the speed of the fan by changing the duty cycle. According to the readings from the temperature sensor duty cycle is changed automatically thus controlling fan speed. Table 1 shows the relationship:

Table 1: Duty Cycle and Temperature

Sr. No.	Temperature (In °C)	Duty Cycle	Speed
1	Less Than 0	0%	Zero
2	0-10	25%	Slow
3	10-20	50%	Medium
4	20-30	75%	Fast
5	30-40	100%	Very Fast
6	Greater Then 40	100%	Very Fast

The 0 percent duty cycle shows low speed, 25 percent duty cycle shows slow speed and medium speed is shown by 50 percent duty cycle, 75 percent duty cycle shows fast speed and very fast shows 100 percent duty cycle. The representation of the duty cycle with temperature (in Celsius) is shown in the Fig 4.

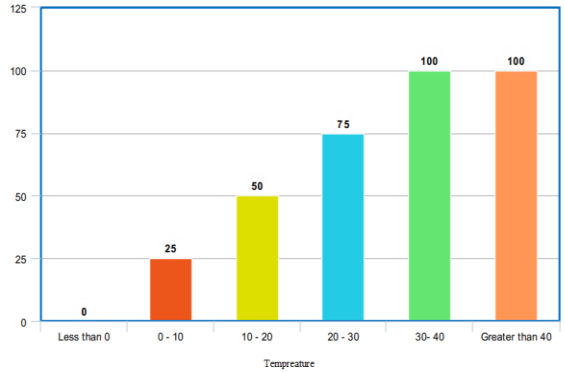

Fig 4: Temperature (in °C) vs Duty Cycle

The representation of duty cycle with temperature (in Fahrenheit) has also been shown in Fig 5. The duty cycle is changing according to the temperature and speed is controlled respectively.

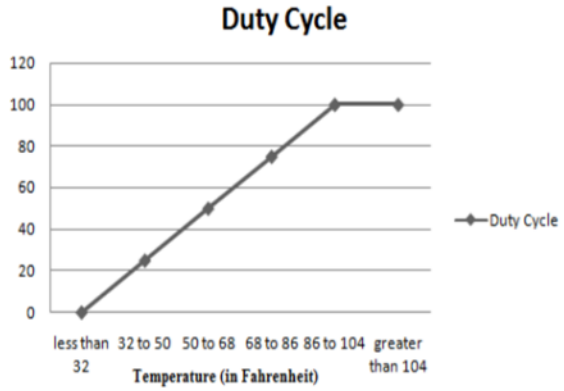

Fig5: Temperature (in °F) vs. Duty Cycle

8. CONCLUSION AND FUTURE ENHANCEMENT

This is a design for controlling the speed of the fan based on temperature using PWM technique is proposed in this paper. Thus, here fan speed has been controlled by using Pulse Width Modulation and Arduino board according to the temperature sensed by the help of Temperature and Humidity Sensor(DHT22).

The idea of the project is to change the fan temperature automatically. PWM technique is found to be the best technique for controlling the fan speed using the sensed temperature. The system is working properly. The speed of fan depends on the temperature and there is no need for regulating the fan speed manually again and again. Previous graphs have been shown for different relationships between different parameters.

This project can be enhanced in terms of area and power.

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