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Weather Based Smart Fan

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Abstract

At present state we are wasting electricity somehow or the other. One of the examples, of this is a living room fan which runs at a constant speed until changed manually. To protect and safeguard one's future we need to save energy. This system is based on a mechanized fan actions/speed controller using Arduino which authorizes actions/speed of the fan based on sensed temperature. Using Arduino microcontroller, it establishes authority and fast processing of all the devices attached to them (sensors and LCD display in this case) to obtain data and allows faster display of data in real time. LCD makes the weather monitoring system so much more convenient and straightforward. Temperature obtained by the sensor and speed of the fan are exhibited on the LCD. Arduino microcontroller is the main hardware in the electrical system, which commands all of the tasks. DHT 11 sensor is a very fast and effective temperature and humidity sensor and it convert the data into transferable signal and forwards it to Arduino microcontroller, which is then displayed on LCD in real time. Transistor is used to control the speed. Further it can be used with other applications like air-conditioner, heater, cooler, incubators, etc.

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1. Introduction

As in today's date and the improvement in technology, smart Systems are launched every day. There is a colossal demand for intelligent electronic systems. Microcontrollers plays a significant job in progress of automatically controlled items and gadgets. Microcontrollers are for the most part a solitary chip microprocessor appropriate for control and computerization of machines and processes, as it burns the code on the hardware and it doesn't need to be changed or manipulated, it serves the same function every time the input is given. Every device in today's age, including air conditioner, lighting systems in homes, toys, kitchen appliances and office machines utilizes Microcontrollers for their activity. Microcontroller comprises of the central processing unit (CPU), clock and counter, interrupt, memory, I/O ports, etc.

This solitary chip incorporated with circuit plan of microcontroller which decreases the dimensions of the board and The Arduino Uno runs short of one day on a 9 V battery since it utilizes around 45 mA current, so the power utilization is less. This framework presents structure and re-enactment of programmed fan speed control framework utilizing pulse width modulation (PWM) strategy dependent on room temperature. A temperature sensor is being utilized to quantify Room temperature and fan speed is regulated by room temperature by utilizing PWM method. PWM is used for controlling the amplitude of digital signals and in this case, we can manipulate it to control the speed of the fan.

To get distinct analog data, we change or regulate the pulse width. The Arduino's coding language makes PWM convenient, and duty Cycle is a variation from 0 - 255, whereas the chosen pin a PWM pin, the PWM pins have a (~) symbol in front of the number

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(PWM pins - 3, 5, 6, 9, 10, or 11). In PWM, a clock over and over tallies from 0 to 255. The fan kills when the timer is at 0, sets on when the clock matches the PWM threshold value. The higher the PWM value, the higher the duty cycle, hence faster the speed of the fan.

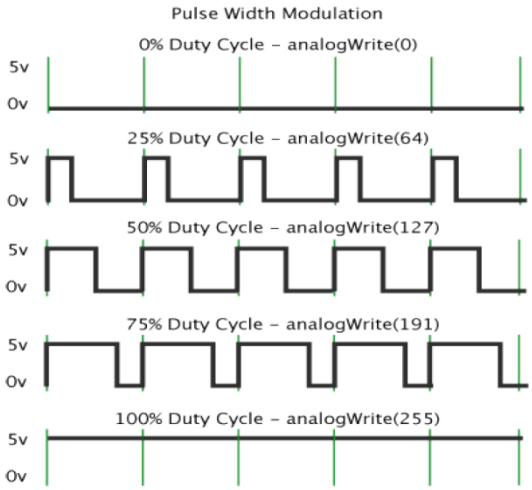

Figure 1: Various Duty Cycle PWM signals.

2. Literature Survey

Several applications and published inventions go across the problem of saving electricity through various methods and provides [2] with an automatic fan controlled by the environmental or weather factors like temperature and humidity it is exposed in and controls the speed using PWM [5] and controls actions of the fan but not a single application or proposed system promises to have a smart fan while continuously monitoring and displaying the weather factors.

We took on to the existing systems which had automatic fan and a weather monitoring system [1] and built more ideas on those to provide mainly 2 things in our new proposed system -

1) Weather monitoring – The system continuously monitors the basic weather factors and displays it all the ways continuously with the time and date, so that we know what the exact weather is at a particular time in our room.

Based on this the main function of the proposed system is conquered.

2) Smart fan – The smart fan decides its' own action provided the weather factors by the weather monitoring system earlier provided.

Advantages – The smart fan saves electricity as the action and the fan pace is commanded by the temperature provided by the weather monitoring system. It can also be used to implement in a huge number of practical applications like smart AC, smart lighting of the house etc.

3. Components

Hardware:

Laptop with listed features below:

- Arduino Uno board
- LCD display
- DHT 11 sensor
- Motor
- Fan

Software:

- Arduino software
- DHT library

4. Methodology

DHT11 sensor is interfaced with Arduino to fetch room temperature and humidity data (Weather factors). The DHT 11 sensor first obtains the data and then the Arduino writes the data to the LCD display which is also attached to the Arduino Uno board for displaying the weather monitoring factors at real time. Next the Smart fan works on the input already provided by DHT 11 sensor to decide the actions of the itself, for example If the temperature is high fan speed goes relatively high. If the temperature is low the fan speed goes low. Also if the temperature is below a particular threshold is set then the fan will be OFF. Data related to temperature and humidity are displayed LCD for user interaction. Fan speed is controlled using PWM Pins available on Arduino. If duty cycle of PWM increases speed of the fan increases and vice versa.

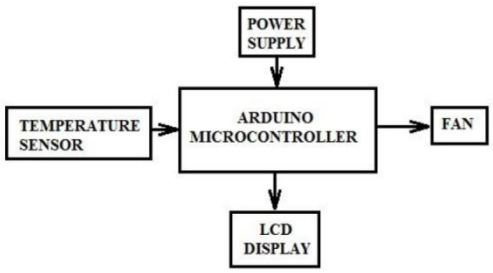

Figure 2: I/O Workflow Block Diagram.

5. Hardware Implementation

ARDUINO UNO – Arduino Uno is an open source microcontroller board dependent on ATmega328P microcontroller developed by Arduino. The board is furnished with set of digital and analog I/O ports that might be interfaced to different extension sheets and different circuits. It has 20 input and output pins in total, 6 of them can be called as PWM pins which have (~) symbol in front of their number.

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Figure 3: Arduino Uno Board

DHT 11 SENSOR - It is rudimentary and a cheap temperature and humidity sensor which provides high reliability and stability. DTH 11 can be interfaced with any microcontroller like Arduino. It is an accurate sensor for basic weather factors and the measurements usually provided by the DHT 11 are precise. The DHT 11 is interfaced with the Arduino Uno board via data, voltage and ground pins.

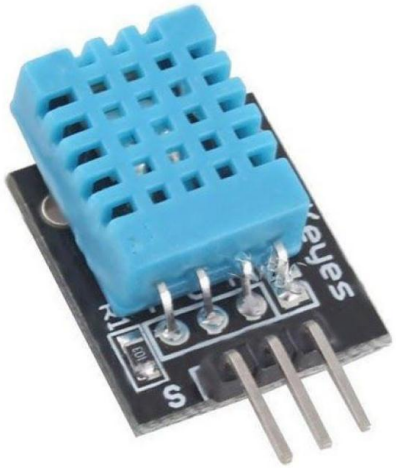

Figure 4: DHT 11 Temperature and Humidity Sensor.

6. Software Implementation

The Arduino software is designed to be user friendly IDE, once the connection is done the code is to be written in the software part with the libraries and I/O pins established in the very first portion of code and then the setup established in the setup function for all I/O pins so that the setup is ready and the Arduino board is ready to implement the function the user provides it with, Next the loop function is defined to serve a function and it works on the code provided to it. In this case the code to be written is to get the temperature and humidity data from the DHT 11 sensor, here is an algorithm-

Step 1 – Introduce all the libraries in need of the application to be built.
Step 2 – Write the setup code to establish all the communication lines from the respected pins.
Step 3 – Get the temperature and humidity values from the sensor attached to the Arduino.
Step 4 – Display the values of weather factors just attained in step 4.
Step 5 – Set the PWM values according to the digital input values.
Step 6 – Communicate the existing values into getting the actions and speed of the fan.

7. Flowchart

The proposed system has two implementations to get the desired output, the first one is to obtain the weather factors but the main data is to get the temperature. The flowchart is as follows-

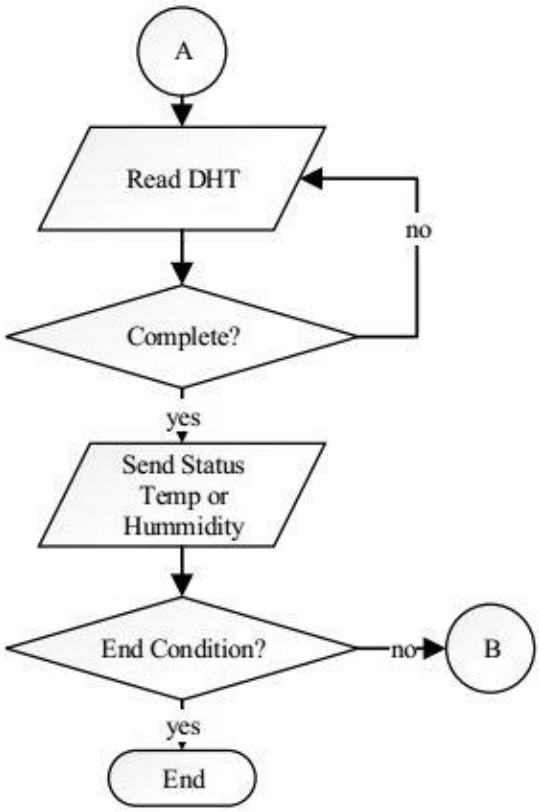

Figure 5: Flowchart, working of DHT 11.

8. Results

The resulting recorded temperature and humidity data based on which the smart fan is about to decide its' action is as follows –

Figure 6: The results of Temperature and Humidity detected.

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The smart fan based on the temperature takes action by which the condition and speed of the fan is determined, the results are as follows –

Table 1: Fan speed Variation according to Temperature values with help of PWM and Duty Cycle.

Temperature	Duty Cycle	PWM Value	Fan Speed
In degree Celsius	In %		In rpm
Less than 26	0%	0	0
26	20 %	51	227
27	40%	102	428
28	60%	153	654
29	80%	204	826
Greater 29	100%	255	1000

9. Conclusion

Arduino based smart fan is implemented. Thus, fan speed is being controlled by using Pulse Width Modulation and as per the temperature detected by the Temperature and Humidity Sensor (DHT 11). The idea of the project is to change the fan temperature automatically based on the temperature obtained by the weather monitoring system and display the weather monitored data in real time on an LCD display, the system is working properly. The scope of this project is vast, it can be used in smart AC's with smarter and advanced options, it can be used in smart lighting in homes controlling the brightness and automatic controls of lights, it can be used in automated air purifiers, it can be used in refrigerators to reduce energy consumption, and many more applications.

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