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Fan Speed Control with Temperature Change Using Arduino

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ABSTRACT

In Recent days, the usage of electricity has reached high due to the increase in usage of electrical devices in domestic and industrial appliances. As power is crucial for economic and Industrial development of a nation, so saving and controlling electricity is important (or) essential. This project proposes on how to design temperature based fan speed control and monitoring with a LM-35 sensor and Arduino. In the proposed work ,the microcontroller controls the speed of an electric fan according to requirement and allows dynamic and faster operation and the LCD used makes the project user friendly and shows the temperature changes and also the efficiency of fan at real time. Hence this project is used to save electricity which consumes less power for usages.

Keywords

DC-Fan, LCD Display,Embedded 'C' Language,LM-35**.**

Introduction

This project proposes to reduce the consumption of electricity and produces more efficiency for the electrical component with a user friendly approach. With the Development of Science and Technology improving efficiency in electrical equipments is necessary for the cutting edge technology to dominate the upcoming digital era. Through this proposed work the regulator used in conventional model fans in domestic and Industrial appliances is excluded and replaced by the LM 35 sensor which senses the temperature of the room and adjust the speed of the fan proportionate to the environmental room temperature. This project makes the consumer to save energy usage in their homes and in respective corporations by using technology.

Literature Review

The conventional method of controlling the speed of the fan is by using regulator. Through this conventional method the electrical energy consumption is more compared to using LM35 sensor. From the research of Tito smailagich, as per the high cost of electrical power consumption by replacing the conventional method of ON/OFF switch reduce the consumption of electrical energy and increases the efficiency of power consumption, as a result of which saves energy and money. Articles published by the Lawrence Berkeley National Laboratory as mentioned that the manufacturing sector alone fans are using about 78.7 billion kilowatt - hours energy every year. From this article we can conclude that the consumption of this is amount to 15% of electricity consumption is done by motor alone. So by going through these above mentioned articles this project replaces conventional type of regulator with LM35 sensor as well as increases or decreases the speed of the fan with respect to room temperature resulting in less energy consumption and the energy saved can be used else where

Methodology

This project works on two distinct range of temperature --- running of fan at minimum temperature---The LM-35 sensor senses temperature of the surrounding area if the temperature is less than 30 degree Celsius the 12V DC fan

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stops or runs at minimum speed. As mentioned the speed of the fan directly proportional to the surrounding temperature. running of fan at maximum temperature----If the room temperature increases the speed of the fan will vary in accordance with the surrounding temperature. This project calculates temperature which varies from 30 degree Celsius to 60 degree Celsius, meanwhile the efficiency of the fan varies from 0% to 100%.Exactly at 60 degree Celsius the speed of the fan is maximum at 100 percent

Problem Statement

Most consumers of today are being reluctant to change the speed of the regulator to control the fan. They are also busy in their work and feel lazy to change the regulator. This project comes up with idea the speed of the fan changes proportionately with the help of Arduino and LM 35 sensor.

Hardware Used

LM-35 Temperature Sensor

LM35 is an IC based sensor which measures the temperature of the room and the environment. with output as electrical directly proportional to the temperature.LM35 temperature sensor measures temperature well precisely than a thermistor. Alternative for thermistor is LM35.It also produces voltage as output in accordance with the room temperature in celsius.LM35 sensor doesn't require any external calibration or trimming. It also maintains a high level of accuracy with respect to temperature. LM35 is utilized or employed in this project because of easy availability likewise as low cost sensor with high range of accuracy in measuring the temperature of the environment. It is a 3 pin sensor which has +5V,output and GND.

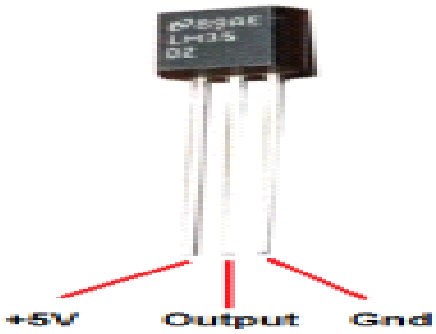

Figure 1. LM-35

Arduino UNO

Arduino is a microcontroller board used to control the entire circuit. The arduino used here comes with microcontroller embedded in it known as ATMEGA328P.ATMEGA328P act as an IC(integrated circuit) for the proposed work. The main purpose of this IC is to control the entire circuit,which commands all the components connected to the different ports of the arduino. The temperature based fan control uses ARDUINO UNO board for maximum desired output as well as high accuracy of reading displayed in the output of the LCD screen. This board embeds the C-language as its code input since it is a programmable board. The advantage of arduino over the other boards is because many circuit embedded boards available in the market are not compatible with the code such as C,C++ etc...This board comes with a crystal oscillator with a frequency of 16MHz.This type of oscillator is employed in this board because it can deal with the time delay, time synchronization etc., Arduino has both digital

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as well as analog pins which is used as different ports for the input as well as output ports. The function of the voltage regulator which regulates the voltage given to the ARDUINO board circuit, since if some un-regulated voltage supply comes to the board it regulates the supply.

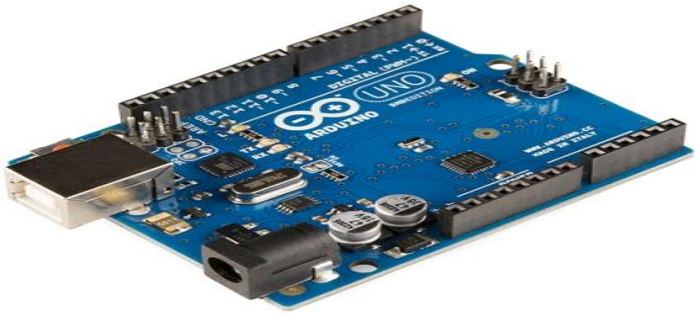

Figure 2. ARDUINO UNO

Arduino IDE

languages which are C,C++.While one of the language employed here is object oriented programming language famously known as C++.Since temperature based fan control uses embedded C-language the program is written in this language.The fan operates The ARDUINO IDE is an software uniquely compatible with the ARDUINO boards. Platform uses the two at different range of temperatures which is greater than 30 degree celcius and lower than 30 degree celcius. The fan operates at the maximum efficiency, when room temperature reaches 60 degree celcius. The OS used here is windows-7 which provides an system environmental setup for the ARDUINO IDE software. IDE is also known as Integrated Development Environment.

Liquid Crystal Display (LCD)

LCD used as an electronic display component as well as it has ubiquitous applications everywhere. Employed nearly in all our day to day applications ranging from domestics uses, projects and mainly for industrial purposes to display the wide ranging parameters. In this project parameters such as efficiency of the fan measured in percentage along with the temperature of the room is being displayed together in a high clarity as well as in user friendly way. Temperature based fan speed control employs 16x2 display where 16 characters are found in each line with number of lines as two enshrined in that display. LCD type of display is preferred over the LED display due to multitude amount of factors such as economically easy to buy ,adaptability range is high and even it has very good characters preferred such as ASCII. As ASCII being the international standard code for exchange of information in electronic format. In this LCD deleting, inserting and as well as re-entering characters is easy compared to LED where ASCII format is not followed. So preferring LED over the LCD display is the best possible to display the output.

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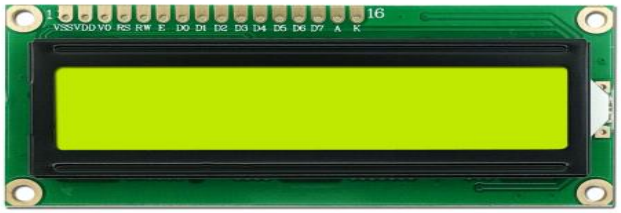

Figure 3. LCD

12V DC Fan

12 volts Direct Current (DC) fan works when the input of 12V direct current supply is given as input. The speed of the fan is controlled using LM35 temperature sensor taking the temperature as the input and controlling the efficiency of the fan as output. Similar to other types of conventional model fans this 12V DC fan also has blades as well as an rotor or impeller.

Figure 4. 12V DC FAN

2N2222

The NPN bipolar junction transistor 2N2222 is being used in this project. The 2N2222 BJT is used for general purpose by amplifying the lower power. The 2N2222 BJT is being utilized here for switching applications.As the conventional type of transistor it has base, emitter and collector. It is manufactured for low to medium current ranges, moderate voltage also operates at a moderately high velocities. It is made using the TO-18 metal.Since the availability of this transistor in easy and as well as very commonly used due to cheap price and adaptability this

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transistor is used in this project. The continuous usage of this transistor is evident because of its popularity. This type of transistor is frequently employed as a small signal transistor.

Figure 5. 2N2222

Resistor

Resistors in general used to employed to resist the flow of current in the circuit. Then it protects the circuit from the unstable movement of electricity. The resistor also follows the ohms law at room temperature. In our project we are employing the CCR type of resistors known as carbon composition resistors which is made up of resistive Cylindrical element which is solid in its content.The value of the resistor is measured using the colour coding technique which is being painted on the resistor. Since this resistor is made up of carbon which is highly non-conductive nature of the current is being used.

Figure 6. RESISTOR

Circuit Diagram and Connections

This project is implemented by the circuit diagram given below.

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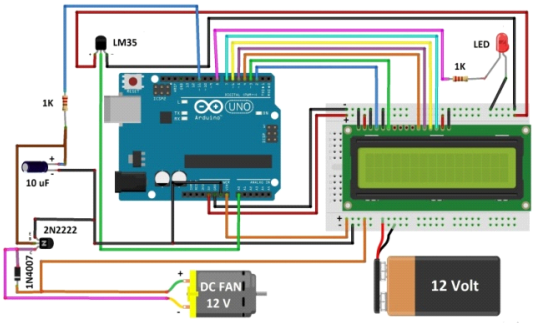

Figure 7. CIRCUIT DIAGRAM

LCD shield is used to display the efficiency of the fan and the temperature of the room. 12V battery is employed to give the power to the circuit. The positive and negative end of the LM35 is connected with the bread board. Resistor of 1K ohms is connected with the digital pin of the Arduino board of -11 pin as well as the other end is connected with the positive end of the capacitor and base of the 2N2222 transistor which works as a switch to the circuit. The collector of the 2N2222 is connected through the IN4007 to the positive end of the 12V DC fan and also the negative is connected to the collector side of the transistor which act as a switch .The output pin of the LM35 is connected to the analog pin of the arduino board. The LED pin is used to indicate whether the speed of the fan crosses minimum and maximum threshold speed of the fan.

Software Implementation

Algorithm

- Set the temp min=30 and set the temp max =60.
- Declare the variable temp to measure the room temperature.
- If the room temperature is less than temp min,the fan speed will be 0.
- If the room temperature is between the temp min and the tamp max,the speed of the fanspeed=1.5*fanspeed.
- If the room temperature is greater than temp max, the LED will burn.
- The loop continues until the user wishes to use the device.

Result And Discussion

The speed of the fan varies as per the dynamic change in the room temperature and consumes less energy in electrical components By using the technology of embedded system, where both the software and the hardware combines together to solve the real world problems.In this case the problem is to solve the electrical energy loss and give more time to user to concentrate on his/ her work and be efficient to cope up with the modern world problems.

Conclusion

The proposed temperature based fan control system works effectively by sensing the changes in the temperature around us. This will be highly useful for physically challenged and senior citizens people. It is a very economic system that can be used for commercial purpose. This work can be extend for industrial purpose in future.

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