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Research paper

Temperature based fan speed control and observing utilizing arduino

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Abstract

For the most part in various climatic conditions individuals will attempting to control the speed of the roof Fan in their room by physically controlling the Fan controller. Yet, by doing this physically is somewhat repetitive undertaking and not exact. Switching Fan regulator more often through manual control may damage the regulator and sometimes leads to current shock. The above discussed problems can be avoided by implementing the speed control mechanism of the fan in automatic way. A sensor is placed in the room to sense the room temperature in degree centigrade. As indicated by distinguished temperature a control circuit will control the speed of the fan. On the off chance that the room temperature is all the more, at that point the speed of the fan will increment. In the event that the room temperature is less, at that point the speed of the fan will naturally diminishes by the control circuit. The innovation OR the circuits utilized as a part of this undertaking are temperature sensor like LM35, and an aurdino UNO.

Keywords: *Fan Regulator; Sensor; LM35; Aurdino UNO.*

1. Introduction

As of late, the home indoor environment has seen a quick presentation of system empowered computerized innovation. This artificial Technology offers new and emerging chances to expand the network of devices inside the home with the end goal of home mechanization [1]. Nonetheless, the appropriation of home mechanization frameworks has been moderate. Thus, this work is a Standard programmed fan speed controller that controls the speed of an electric fan as indicated by our prerequisite. Utilization of Embedded innovation influences this shut circle input to control framework proficient and solid. Miniaturized scale controller permits Dynamic and quicker control. Fluid precious stone show (LCD) makes the framework easy to use. The detected temperature and fan speed level esteems are at the same time shown on the LCD board.

This undertaking is an independent programmed fan speed controller that controls the speed of an electric fan as indicated by the necessity. Utilization of implanted innovation influences this shut circle criticism to control framework effective and solid. The microcontroller (MCU) ATMega8/168/328 permits dynamic and speedier control and the LCD makes the framework easy to understand. Detected temperature and fan speed levels are all the while showed on the LCD board. The undertaking is extremely smaller and utilizes a couple of parts as it were. It can be executed for a few applications including aeration and cooling systems, water-warmers, snow-melters, stoves, warm exchangers, blenders, heaters, hatcheries, warm showers and veterinary working tables. The task will help spare vitality/power [9].

2. Fan speed control system components

The arduino is the core of the framework. It acknowledges contributions from the temperature sensor, LM35 which takes into account the estimation of the present room temperature, at that point the controller will give the activity to keep up the required fan speed [4]. LCD is utilized to show the fan speed and room temperature. These can be condensed in a chart as appeared in Fig. 1

2.1. Fan speed control system

A low-recurrence beat width tweak (PWM) flag, more often than not in the scope of around 30Hz, whose obligation cycle is changed to alter the fan's speed is utilized. An economical, single, little pass transistor can be utilized here. It is effective in light of the fact that the pass transistor is utilized as a switch.

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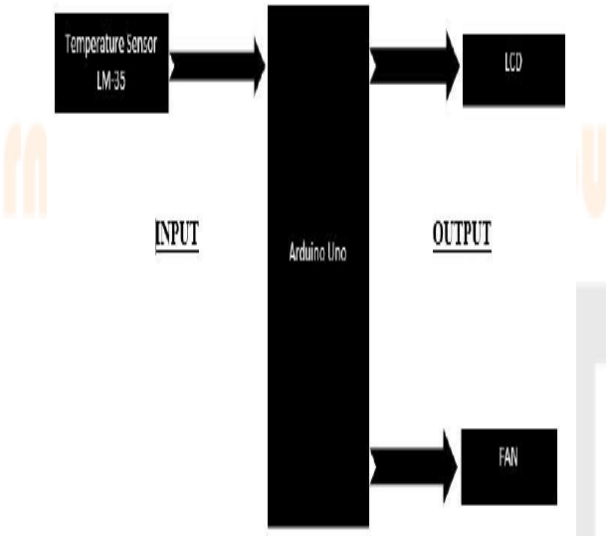


Fig. 1: Block Diagram of Fan Speed Control System.

2.2. Arduino (microcontroller)

A microcontroller is a PC control framework on a solitary chip. It has numerous electronic circuits incorporated with it, which can disentangle composed directions and change over them to electrical signs. The microcontroller will then advance through these guidelines and execute them one by one. For instance of this a microcontroller could be utilized to control the fan speed as indicated by the temperature of the room [5] [6]. There are distinctive sorts of microcontroller, this undertaking center just around the Arduino Uno Microcontroller where its stick outline is appeared in fig.2

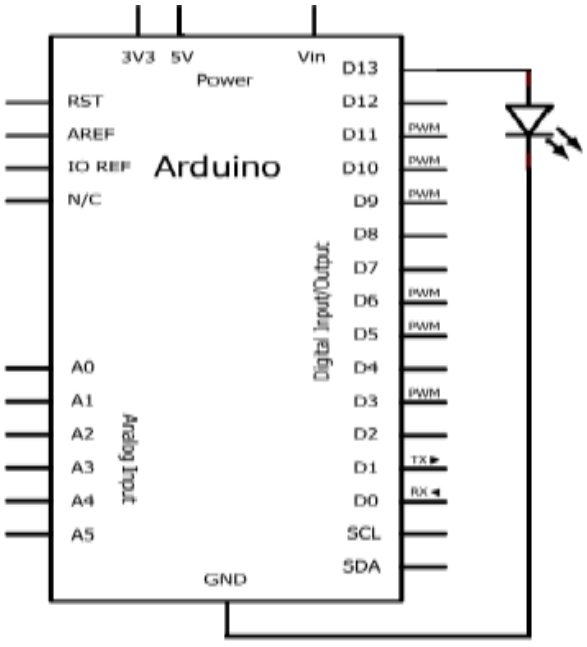


Fig. 2: Pin Diagram of Arduino.

2.3. Sensor based temperature monitoring device (LM35)

The LM35 series are high accurate IC Calibrated Directly in degree Celsius (Centigrade) .Its Linear scale factor + 10 mV/°C .Its Ensured Accuracy is 0.1 degree Celsius .This will make it as an advantage over linear temperature. It is rated from −50°C to +150°C [7]. It is more suitable for Remote Applications.

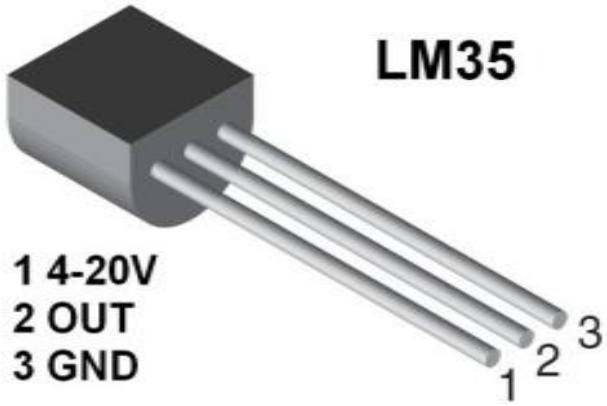


Fig. 3: LM 35 Temperature Sensors.

2.4. Relay (4 Channel, 5V)

We can control High Voltage electronic gadgets utilizing transfers. A Relay is really a switch which is electrically worked by an electromagnet. The electromagnet is enacted with a low voltage, for instance 5 volts from a microcontroller and it pulls a contact to represent the deciding moment a high voltage circuit.

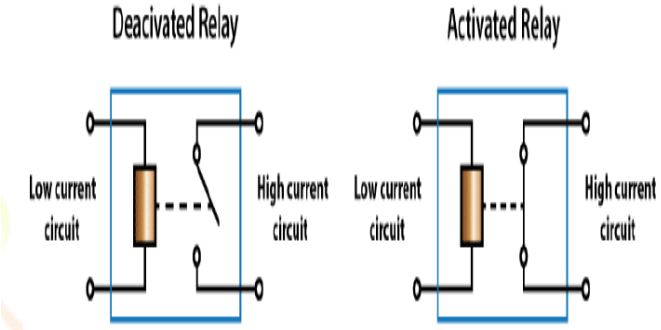


Fig. 4: Relay Circuit Diagram.

2.5. Liquid crystal display (LCD)

This 2 x 16 segment is specifically utilized with microcontrollers, which implies that it can't be designed by standard IC circuits. The main purpose of this device is for displaying diverse messages on a smaller than normal fluid precious stone show. It can show messages in two lines with 16 characters each. Additionally this can show every one of the letters of letters in order, Greek letters, accentuation marks, and numerical images and so on. Fig. 3 delineates LCD (2 x 16 characters) and its association [8]

3. Circuit working

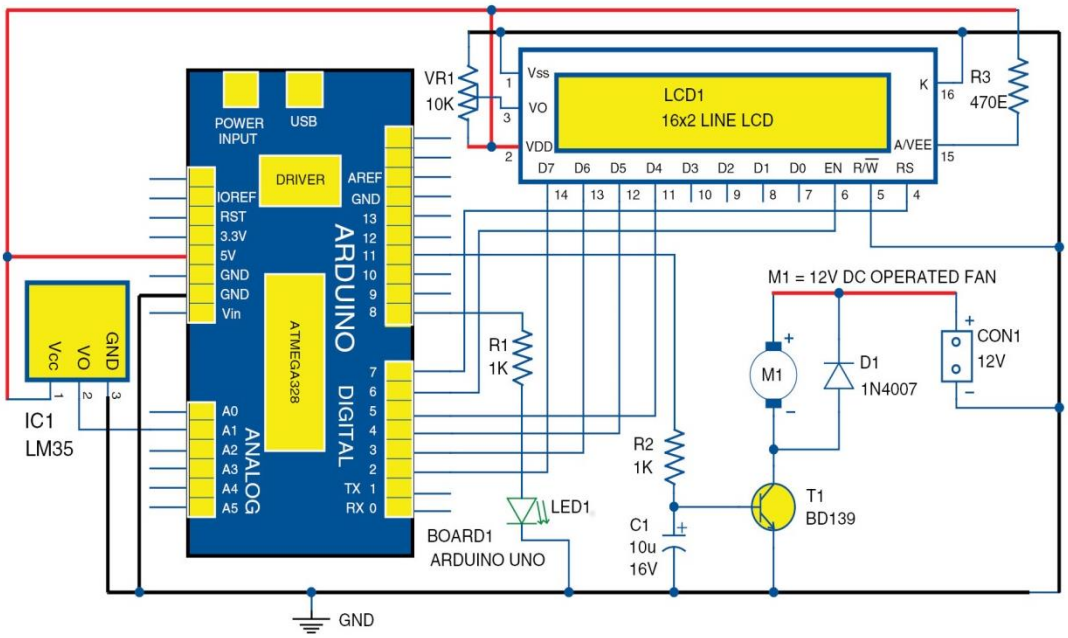


Fig. 5: Circuit Outline of the Temperature-Based Fan Speed Control and Checking Utilizing Arduino.

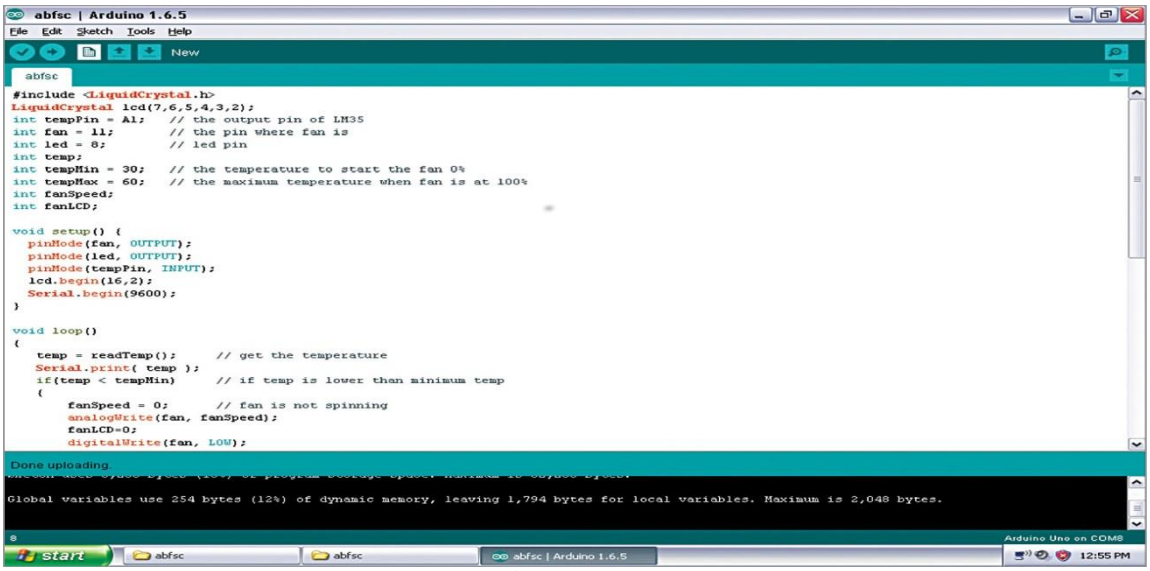


Fig. 6: Screenshot of the Source Code on Arduino IDE.

Circuit outline of the temperature fan speed control and checking is appeared in Fig. 5. It is worked around Arduino Uno board (Board1), 16×2 LCD (LCD1), temperature sensor LM35 (IC1) and a couple of other components.Arduino is at the core of the circuit as it controls all capacities [2].

LM35 is an accuracy incorporated circuit whose yield voltage is directly corresponding to Celsius (Centigrade) temperature. The temperate ranges from - 55°C to 150°C in critical environments. It has +10.0mV/Celsius straight scale factor.

Temperature sensor LM35 faculties the temperature and proselytes it into an electrical (simple) flag, which is connected to the MCU through a simple to-computerized converter (ADC). The simple flag is changed over into advanced arrangement by the ADC. Detected estimations of the temperature and speed of the fan are shown on the LCD. Temperature and observing utilizing Arduino the MCU on Arduino drives the engine driver to control fan speed. Comment of this approach, be that as it may, is that it can make the fan loud due to the beat idea of the flag. The PWM waveform's sharp edges make the fan's mechanical structure move (like a severely planned amplifier), which can without much of a stretch be perceptible [8].

4. Programming

Programming for the programmed temperature controller and screen circuit is composed in Arduino programming dialect. Arduino Uno is modified usingArduino IDE software.ATmega328P on Arduino Uno accompanies a pre-customized bootloader that enables clients to transfer another code to it without utilizing an outside equipment programmer.Connect Arduino board to the PC and select the right COM port in Arduino IDE. Incorporate the program (outline). At that point select the right board from Tools Board menu in Arduino IDE and transfer the draw (abfc.ino) to Arduino through standard USB port [10].

PARTS LIST	
Semiconductors:	
Board1	- Arduino Uno
LCD1	- 16x2 LCD
IC1	- LM35 temperature sensor
T1	- BD139 npn transistor
D1	- 1N4007 rectifier diode
LED1	- 5mm LED
Resistors (all 1/4-watt, ±5% carbon):	
R1, R2	- 1-kilo-ohm
R3	- 470-ohm
VR1	- 10-kilo-ohm preset
Capacitor:	
C1	- 10µF, 16V electrolytic
Miscellaneous:	
CON1	- 2-pin terminal connector
CON2	- 3-pin connector
CON3	- 8-pin connector
M1	- 12V DC operated fan
	- 12V battery for fan

5. Basic experimental setup

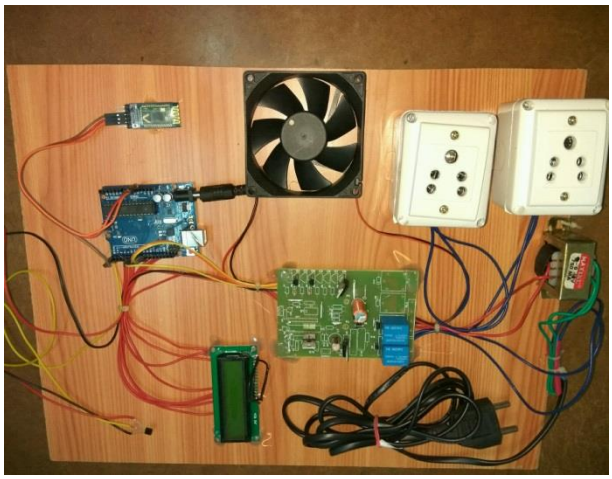


Fig. 7: Basic Experimental Setup.

6. Results



Fig. 8: Experimental Setup for Fan (Off Mode) with Normal Temperature.

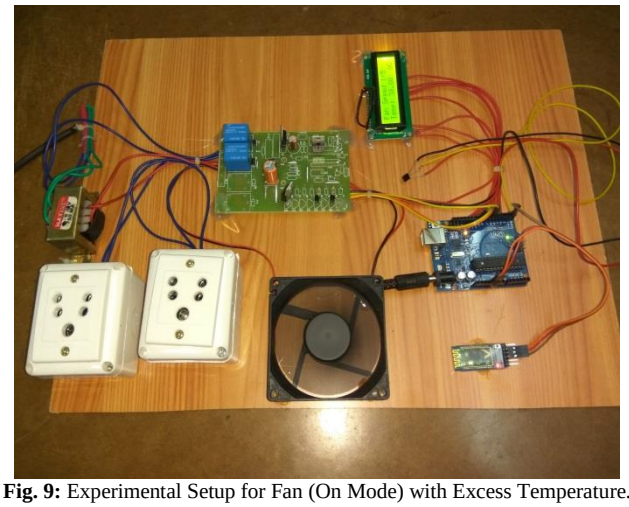


Fig. 9: Experimental Setup for Fan (On Mode) with Excess Temperature.

7. Conclusion

This venture explains the plan and development of fan speed control framework to control the room temperature. The temperature sensor was painstakingly measured the room temperature. Additionally, the microcontroller had been utilized to control the fan speed utilizing the fan speed in rpm and the arduino was effectively customized utilizing C/C++ Language to contrast temperature and standard temperature and set fan speed and their esteems showed on LCD. Also, if the temperature in the room is beyond the range the fan speed will increase automatically.

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