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Temperature Based Fan Speed Control

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ABSTRACT

As we all know that we are slowly moving toward automation, And automation is one of the trending topics. So basically in this project we will be controlling fan speed with respect to the temperature. The system will get the temperature from the temperature Sensor and it will control As we all know that we are slowly moving toward automation and Automation is one of the the speed according to the temperature, set by the user. In this project, microcontroller forms the processing part, which firstly senses the temperature and the controller then compares the data with the set temperature. If the current temperature is greater than the set temperature, the controller turns ON the fan and the set speed will be proportional to the difference between the set temperature & the current temperature. The fan's speed will change according to the temperature.An Arduino uno with atmega328 microcontroller is required to fulfil this process.The value of the temperature can be seen on the LCD.Now a day's every system is automated in order to face new challenges. In the present days Automated systems have less manual operations, flexibility, reliability and accurate. Due to this demand every field prefers automated control systems. Especially in the field of electronics, automated systems are giving great performance

1. INTRODUCTION

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic controlsystems, etc. It is a common circuit and widely used in many applications. It is also one of the most sensible solutions to offer a comfortable and energy efficient. Where in this method, any change in the . temperature will give any change in the fan speed. . So, an automatic temperature control system technology is needed for the controlling purpose in the fan speed according to the temperature changes. This project results in the automation of fans where there will no need to switch the regulators up and down to change the speed of the fan. Sssssso by the usage of microcontroller the fans can automatically change is RPM by the use of heat & temperature sensor.

2. CONSTRUCTION AND WORKING

A Hardware model is designed to obtain the objective of the project.To describe the working of a project a block diagram is proposed.The block diagram proposed can be seen in figure. 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 Dallas temperature sensor. Temperature sensor is used to sense the temperature and then speed of the fan is adjusted based on the threshold we set. We can change the threshold levels using switches.

There are several software and hardware requirements for this project.The various reauirements are given below.

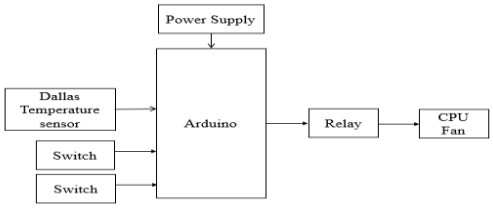


FIG: Block diagram of proposed method

A.HARDWARE REQUIREMENTS:

ARDUINO

The Arduino has 14 digital I/O pins labeled 0 to 13 that can be used to turn motors and lights on and off and read the state of switches. The Arduino programming language is a simplified version of C/C++.Each digital pin can sink or source about 40 mA of current. This is more than adequate for interfacing to most devices, but does mean that interface circuits are needed to control devices other than simple LED's To interact with the outside world, the program sets digital pins to a high or low value using C code instructions, which corresponds to +5 V or 0 V at the pin. The pin is connected to external interface electronics and then to the device being switched on and off.

To determine the state of switches and other sensors, the Arduino is able to read the voltage value applied to its pins as a binary number. The interface circuitry translates the sensor signal into a 0 or +5 V signal applied to the digital I/O pin. Through a program command, the Ardiomp interrogates the state of the pin. If the pin is at 0 V, the program will read it as a 0 or LOW. If it is at +5 V, the program will read it as a 1 or HIGH The ATmega48PA/88PA/168PA/328P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega48PA/88PA/168PA/328P achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

DS18B20 TEMPERATURE SENSOR

The working principle of this DS18B20 temperature sensor is like a temperature sensor. The resolution of this sensor ranges from 9-bits to 12-bits. But the default resolution which is used to power-up is 12-bit. This sensor gets power within a low-power inactive condition. The temperature measurement, as well as the conversion of A-to-D, can be done with a convert-T command. The resulting temperature information can be stored within the 2-byte register in the sensor, and after that, this sensor returns to its inactive state.

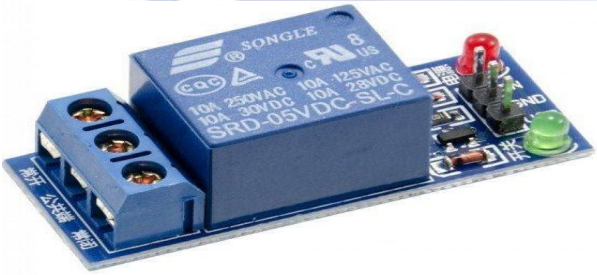
If the sensor is power-driven by an exterior power supply, then the master can provide read time slots next to the Convert T command. The sensor will react by supplying 0 though the temperature change is in the improvement and reacts by supplying 1 though the temperature change is done.

The digital temperature sensor like DS18B20 follows single wire protocol and it can be used to measure temperature in the range of -67oF to +257oF or -55oC to +125oC with +-5% accuracy. The range of received data from the 1-wire can range from 9-bit to

12-bit. Because, this sensor follows the single wire protocol, and the controlling of this can be done through an only pin of Microcontroller. this sensor can be done through a one-wire bus protocol which uses one dat line to communicate with an inner microprocesso Additionally, this sensor gets the power supply directl from the data line so that the need for an external powe supply can be eliminated The DS18B20 is one type c temperature sensor and it supplies 9-bit to 12-b readings of temperature. These values show th temperature of a particular device. The communication of. The applications of the DS18B20 temperature sensor include industrial systems, consumer products, systems which are sensitive thermally, thermostatic controls, and thermometers.

RELAY

A relay is an electromagnetic switch that is used to turn on and turn off a circuit by a low power signal, or where several circuits must be controlled by one signal. Relays are simple switches which are operated both electrically and mechanically,which are used in industrial applications for effective working.



A relay circuit is used to realize logic functions. They play a very important role in providing safety critical logic.

Relays are used to provide time delay functions. They are used to time the delay open and delay close of contacts.

Relays are used to control high voltage circuits with the help of low voltage signals. Similarly they are used to control high current circuits with the help of low current signals.

They are also used as protective relays. By this function all the faults during transmission and reception can be detected and isolated.

The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits..relays played an important role.

CPU FAN

A **computer fan** is any **fan** inside, or attached to, a **computer** case used for active cooling. **Fans** are used to draw **cooler** air into the case from the outside, expel warm air from inside and move air across a heat sink to cool a particular component

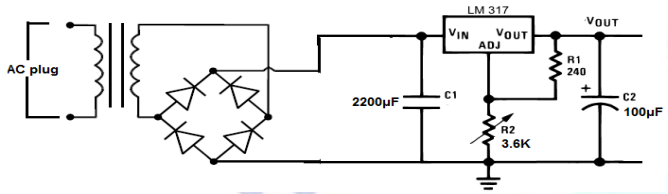
A CPU fan is the dedicated fan that helps keep the processor cool. Processors generate heat from internal electrical energy. The more demand placed on a CPU, the harder it works, and the warmer it gets.

The sole function of computer fans is to cool the system by drawing colder air from the outside into the computer chambers and components, mainly, the CPU. In some computers, you will find the fan as a component of its power supply where it is performing its cooling function

POWER SUPPLY

A power supply is a component that provides at least one electrical charge with power. It typically converts one type of electrical power to another.A power supply provides electrical power to components. Usually the term refers to devices built into the powered

component.Computer power supplies, for example, convert AC current to DC current and are generally located along with at least one fan at the back of the computer case.Most computer power supplies also have an input voltage switch that, depending on the geographic location, can be set to 110v/115v or 220v/240v.



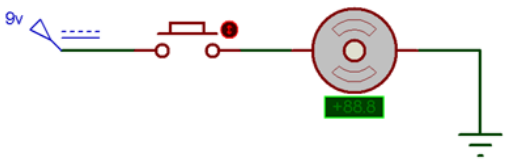
Some basic components used in the supply of power are Transformer,Rectifier,capacitors,voltage regulators.

SWITCH

A Push Button switch is a type of switch which consists of a simple electric mechanism or air switch mechanism to turn something on or off.

Depending on model they could operate with momentary or latching action function. We have a selection of push button switches here at Herga.

Push-Buttons are normally-open **tactile switches**. Push buttons allow us to power the circuit or make any particular connection only when we press the button. Simply, it makes the circuit connected when pressed and breaks when released. When connecting in between of supply and the circuit we should only connect the wires with both the legs of the Push-Button as shown in the circuit below:



A Push-Button can also be used for the triggering purpose like of SCR.

B.SOFTWARE REQUIREMENTS:

Arduino IDE:

Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

Introduction to Arduino IDE:

- Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- This environment supports both C and C++ languages.

3. HARDWARE DESCRIPTION

The circuit is designed to automate the control of a fan based on the temperature.The Microcontroller gets input from the temperature sensor and it gets power from the supply.The supply gets rectified and it is controlled by the relay connected to the microcontroller.A set temperature is adjusted in the microcontroller using the pushbuttons and it can be seen in the LCD

display.Hence,themicrocontroller compares between the set temperature and temperature of the environment for controlling the load. A set of instructions are dumped in the arduino using c or c++languages.If the set temperature is more than the environment temperature the fan stops automatically and if the set temperature is lesser or equal to the environment temperature the fan starts automatically.The complete hardware design can be seen in the following figure.

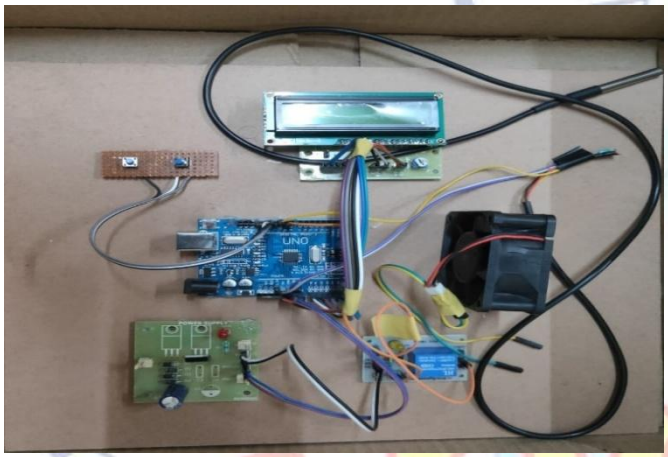


FIG:Complete protocol hardware model

4. CONCLUSION AND FUTURE SCOPE

We have to explore and expand the technologies.The hardware for controlling of a fan based on a temperature using a microcontroller is designed.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. Hence automation is obtained . This circuit gives an efficient ,accurate way of speed control of a fan.The developed model and power circuit functions properly and works according to the application requirement.This circuit can be used in industrial and domestic applications. The circuit designed is simple and costs of the equipment used in the circuit is very low and hence it is cost effective. It is an automatic controlling machine.

When temperature exceeds the limit a call will be dialled to the given number by an automatic dialled system. With this circuit, an alarm circuit can be added and used effectively in large equipment's where the risk of being overheated and explosions are the serious problems, in various industries.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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