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Temperature Controlled Fan

Mr. Balaji Ganesh Bhosale, Mr. Krishna Vishwanath Gaikwad,
Mr. Rohan Ramakant Favade, Prof. Abdul Samad M. Kazi
[*,1,2,3]Student, Department of Computer Engineering
[4]*HOD* in Diploma in Computer Engineering
Vishweshwarayya Institute of Engineering and Technology, Almala, India

Abstract: *A temperature controlled fan is an automatic cooling system designed to regulate fan speed according to the surrounding temperature. The main objective of this project is to develop an efficient system that can automatically control the operation of a fan based on temperature changes. This helps maintain a suitable temperature in electronic devices and environments while reducing unnecessary power consumption.*

The system works using a temperature sensor, such as an LM35 sensor or thermistor, which continuously monitors the surrounding temperature. The sensor converts temperature variations into electrical signals and sends them to a control circuit or microcontroller. The controller processes the received data and determines the required fan speed. When the temperature rises above a predetermined level, the controller increases the speed of the fan to provide sufficient cooling. Similarly, when the temperature decreases, the fan speed is reduced or the fan may stop completely.

Keywords*:* Arduino, Disply, ds18b20Sensors, 12v power supply, 12V DC FAN

I. INTRODUCTION

A **temperature controlled fan** is an automatic cooling system that adjusts its speed according to the surrounding temperature. This type of fan is commonly used in electronic devices, industries, and homes to maintain a safe and comfortable temperature. The main purpose of a temperature controlled fan is to provide efficient cooling while saving electrical energy.

In many electronic systems such as computers, power supplies, and control panels, excessive heat can damage components and reduce their lifespan. A temperature controlled fan helps prevent overheating by increasing its speed when the temperature rises and decreasing its speed when the temperature drops. This automatic operation ensures proper cooling without the need for manual control.

The system generally works using a temperature sensor such as a thermistor or temperature sensing integrated circuit. The sensor continuously measures the surrounding temperature and sends signals to a control circuit or microcontroller. Based on the detected temperature, the controller adjusts the speed of the fan. When the temperature exceeds a predefined limit, the fan rotates faster to remove heat from the system. When the temperature is low, the fan runs slowly or may even stop, which reduces noise and power consumption.

II. LITERATURE REVIEW

Many researchers have studied temperature controlled fan systems to improve cooling efficiency and reduce energy consumption. These systems automatically adjust the speed of a fan based on the surrounding temperature using sensors and control circuits.

Several studies focus on the use of temperature sensors and microcontrollers to control fan speed. A research work on a temperature-based fan speed controller used an Arduino microcontroller and LM35 temperature sensor to monitor temperature continuously and adjust the fan speed accordingly. The system displays the temperature and fan speed on an LCD, making the system user-friendly and efficient. This approach shows that embedded systems can provide accurate and automatic cooling control.

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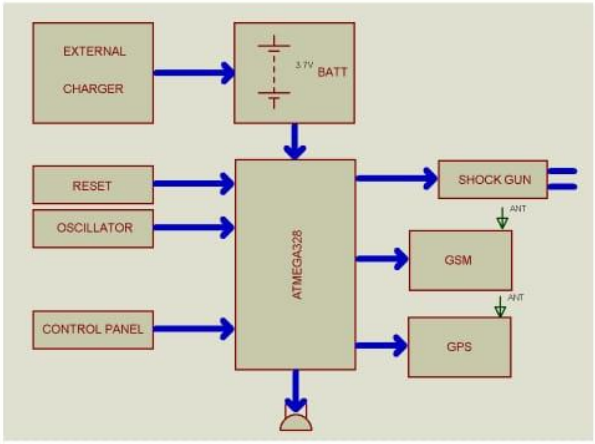
III. SYSTEM DESIGN AND METHODOLOGY A.

1. System Design

The **Temperature Controlled Fan System** is designed to automatically regulate the speed of a fan based on environmental temperature. The design integrates sensing, processing, and control units to achieve efficient cooling.

1.1 Block Diagram Description

The system consists of the following blocks:



Temperature Sensor → Microcontroller → Driver Circuit (MOSFET) → Fan
Temperature Sensor (DS18B20): Detects surrounding temperature
Microcontroller (Arduino Uno): Processes sensor data
Driver Circuit (MOSFET): Acts as a switch/amplifier
Fan (12V DC): Provides cooling

1.2 Hardware Design

The temperature sensor is connected to the Arduino input pin
The MOSFET is connected between Arduino and fan
The fan is powered using a 12V power supply
Proper grounding is maintained for stable operation

1.3 Software Design

Program is written in Arduino IDE
Temperature thresholds are defined in code
PWM (Pulse Width Modulation) is used to control fan speed
Continuous loop monitors temperature

2. Methodology

The methodology explains the working steps of the system:
Step 1: Temperature Sensing
The DS18B20 sensor continuously measures ambient temperature.

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Step 2: Signal Processing
The sensed data is sent to the Arduino, where it is processed and compared with preset values.
Step 3: Control Logic
Based on temperature:
Below threshold → Fan OFF
Moderate temperature → Fan runs at medium speed
High temperature → Fan runs at full speed
Step 4: Actuation
The Arduino sends control signals to the MOSFET, which regulates the fan speed.
Step 5: Continuous Monitoring
The system keeps repeating the process to maintain optimal temperature.

IV. HARDWARE COMPONENTS

HARDWARE COMPONENTS IN TEMPERATURE CONTROLLED FAN

The hardware components are the physical parts used to build the Temperature Controlled Fan system. Each component plays an important role in sensing, processing, and controlling the fan operation.

1. Temperature Sensor (DS18B20)
It is a digital temperature sensor.
Measures the surrounding temperature accurately.
Sends temperature data to the microcontroller.
Works on one-wire communication, so fewer connections are required.

2. Microcontroller (Arduino Uno)
It is the brain of the system.
Reads temperature data from the sensor.
Processes the data and makes decisions.
Sends control signals to the MOSFET to operate the fan.

3. MOSFET (Metal Oxide Semiconductor Field Effect Transistor)
Acts as an electronic switch.
Controls the power supplied to the fan.
Allows speed control using PWM signals from Arduino.
Efficient and suitable for high current devices like fans.

4. 12V DC Fan
Main output device of the system.
Provides cooling based on temperature conditions.
Speed varies depending on control signal from MOSFET.

5. Power Supply (12V DC)
Provides required power to the fan and circuit.
Arduino may use separate 5V supply or regulator.
Ensures stable operation of the system.

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V. EXPERIMENTAL SETUP

1. Introduction

The experimental setup describes how the hardware components are arranged and connected to test the working of the Temperature Controlled Fan system. It ensures proper functioning and accurate results.

2. Components Used in Setup

Temperature Sensor (DS18B20)
Arduino Uno (Microcontroller)
MOSFET (Driver Circuit)
12V DC Fan
12V Power Supply
Breadboard
Jumper Wires

3. Setup Arrangement

The components are connected as follows:

3.1 Sensor Connection

DS18B20 sensor is connected to the Arduino input pin.
It continuously senses the surrounding temperature.

3.2 Microcontroller Setup

Arduino Uno is connected to the computer using a USB cable.
The program (code) is uploaded using Arduino IDE.

3.3 MOSFET Connection

MOSFET is connected between Arduino and fan.
Gate terminal → Arduino output pin
Drain → Fan negative terminal
Source → Ground

3.4 Fan Connection

Fan positive terminal → 12V power supply
Fan negative terminal → MOSFET drain

3.5 Power Supply

12V supply is used to run the fan
Arduino is powered via USB or 5V supply

4. Working Setup

The circuit is assembled on a breadboard.
Proper grounding is ensured.
The sensor is placed in the environment where temperature needs to be measured.

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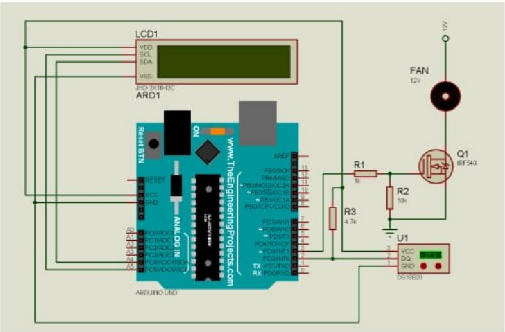
VI. RESULT AND DISCUSSION



1. Result

The Temperature Controlled Fan system was successfully designed and tested. The system responded correctly to changes in temperature and controlled the fan speed automatically.

Observed Results

At **low temperature**, the fan remained **OFF**.
At **moderate temperature**, the fan ran at **medium speed**.
At **high temperature**, the fan operated at **full speed**.
The temperature sensor provided **accurate and stable readings**.
The microcontroller processed data efficiently and controlled the fan without delay.

Sample Observation Table

Temperature (°C)	Fan Status	Fan Speed
Below 35°C	OFF	0%
40°C – 45°C	ON	Medium (50%)
Above 50°C	ON	High (100%)

2. Discussion

The results show that the system works effectively in controlling the fan based on temperature variations.

Performance Analysis

The system provides **automatic control**, reducing the need for manual operation.
Energy efficiency is achieved as the fan runs only when required.
The use of a **MOSFET** ensures smooth and reliable switching.
The **Arduino Uno** processes input data quickly, resulting in real-time response.

Advantages Observed

Simple and cost-effective design
Accurate temperature sensing
Quick response to temperature changes
Reliable and stable performance

VII. CONCLUSION

The **Temperature Controlled Fan system** has been successfully designed and implemented. The system is capable of automatically controlling the operation and speed of the fan based on the surrounding temperature.

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The use of a temperature sensor ensures accurate detection of environmental conditions, while the microcontroller processes the data and makes quick decisions. The MOSFET effectively controls the fan, allowing smooth and efficient operation.

VIII. ACKNOWLEDGMENT

We would like to express our sincere gratitude to **Vishweshwarayya Institute of Engineering and Technology, Almala**, for providing us with the necessary resources and guidance to successfully complete this **research on** " Temprature Controlled Fan"

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Authors:

Balaji Bhosale, Krishna Gaikwad, Rohan favade

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https://datasheets.maximintegrated.com/en/ds/DS18B20.pdf
(Used for sensor specifications and working)

Electronics Tutorials Website
https://www.electronics-tutorials.ws/
(Used for basic electronics concepts like MOSFET and circuits)

YouTube Tutorials on Arduino Projects
(Various educational videos for practical implementation of temperature controlled fan)

Books:
“Getting Started with Arduino” by Massimo Banzi
“Electronic Devices and Circuit Theory” by Robert L. Boylestad

Research Papers & Online Articles
Articles related to temperature-based automatic fan control systems
Basic embedded system design references