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A Project Report on

TEMPERATURE BASED FAN SPEED CONTROL AND MONITORING

Submitted by

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M. KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR-639113.

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BONAFIDE CERTIFICATE

Certified that this report titled **“TEMPERATURE BASED FAN CONTROL AND MONITORING SYSTEM ”** is the Bonafide work of **DHARSAN S (927623BEE023), DINESH KUMAR (927623BEE025), DINESH S (927623BEE026) , ELAMURUGAN M (927623BEE028) , HARIVASANTH A (927623BEE032) ,** who carried out the work during the academic year (2024-2025) under my supervision.

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VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry, and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To develop globally competent Electrical Engineers with expertise in education and cutting edge research technologies thereby contribute value to their career and society.

MISSION

M1: Knowledge: To bestow quality education in Electrical and Electronics Engineering and prepare the students for career development and higher studies.

M2: Skill: To Excel in Contemporary core and Interdisciplinary areas with Prime Research Facilities and Industrial collaborations

M3: Attitude: To augment student competency along with moral and ethical values through academics to serve the society

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 01 – Knowledge

To empower graduates with high standards of technical knowledge making them readily employable or well prepared for pursuing higher education to thrive in their career development

PEO 02 - Skills

To produce graduates with interdisciplinary skills who can contribute meaningfully to cutting-edge research and innovation in emerging areas, thereby making a significant impact on their respective industries and the global community.

PEO 03 - Attitude

To develop highly competent professionals who are also committed to uphold the highest standards of ethical conduct and moral consciousness in the society.

PROGRAMME OUTCOMES(POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions:

Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6:The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7:Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The following are the Program Specific Outcomes of Engineering Students:

PSO 01

To demonstrate proficiency in Core Electrical areas such as Electrical Circuits, Electromagnetic fields, Control Engineering, Instrumentation, Electrical Drives, Power System and Power Electronics to Solve Practical Engineering Problems.

PSO 02

To analyze, design and develop Electronic circuits and systems through insights acquired in Integrated circuits, Embedded systems, Analog and Digital Electronics.

PSO 03

To apply technical competency, management and interdisciplinary skills for developing socially acceptable solutions to complex emerging area problems and its applications

Abstract (Key Words)	Mapping of POs and PSOs
Arduino microcontroller, temperature sensor, Voltage regulator, Real-time monitoring	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,PO9.PO10,PO11,PO12,PSO1,PSO2,PSO3.

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We are glad to thank all the **Faculty Members** of **Department of Electrical and Electronics Engineering** for extending a warm helping hand and valuable suggestions throughout the project.

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TABLE OF CONTENTS

ABSTRACT

This project presents the design and implementation of a temperature-based fan speed control and monitoring system using an Arduino microcontroller, a 16x2 LCD display, an LM35 temperature sensor, and a voltage regulator. The primary objective is to automatically control the fan speed based on temperature readings from the LM35 sensor. As the temperature changes, the system adjusts the fan's speed proportionally, providing an efficient and energy-saving approach to temperature control. The system also displays real-time temperature and fan speed status on the LCD, making it ideal for applications in industrial and domestic environments where controlled cooling is necessary

CHAPTER 1

INTRODUCTION

The **Temperature-Based Fan Speed Control and Monitoring System** is an innovative and automated solution designed to regulate the speed of a fan based on ambient temperature. It combines the capabilities of modern microcontroller technology (Arduino) with efficient sensing and actuation mechanisms, offering a smart alternative to manual fan speed control.

Temperature control systems play a vital role in applications ranging from household appliances to industrial environments where maintaining optimal thermal conditions is critical. Traditional fan control systems either operate at a fixed speed or rely on manual adjustment, which may not always be energy-efficient or convenient.

This project employs an **LM35 temperature sensor** to measure the surrounding temperature and an Arduino to process the data and adjust the fan's speed accordingly using **PWM (Pulse Width Modulation)** signals. A **16x2 LCD** display provides real-time feedback on the temperature and fan speed, making it easy for users to monitor system performance.

The system's automation reduces energy consumption by ensuring that the fan operates only at the speed required to maintain the desired temperature. Its simplicity, cost-effectiveness, and versatility make it suitable for diverse applications, including home automation, cooling electronic equipment, and climate control in workspaces.

This project introduces a practical approach to solving energy efficiency and convenience issues, demonstrating the potential of microcontroller-based automation in daily life.

CHAPTER 2

LITERATURE REVIEW

VishnuPriya,R.,&Nirmala,M."Automatic Temperature-Based Fan Speed Controller Using Arduino."(2024)

This paper focuses on designing an automatic temperature-based fan speed controller using Arduino. It explores how temperature variations detected by an LM35 sensor can drive a fan's speed via PWM control for efficient cooling. It emphasizes energy savings and automation.

Venkatesh, R., & Kumar, S"Temperature-Controlled Fan Using Arduino for Energy Efficiency." (2023):

This paper focuses on developing a temperature-controlled fan system using Arduino to enhance energy efficiency. It integrates the LM35 temperature sensor and PWM technique to dynamically adjust the fan speed based on environmental temperature changes. This study highlights energy savings achieved through precise control mechanisms and discusses its applications in domestic and industrial cooling systems.

Priya, S., & Maheshwari, K. "IoT-Based Home Automation with Arduino and Fan Speed Control." (2019):

The paper demonstrates the integration of the DHT11 temperature and humidity sensor with Arduino to create a smart cooling system. It emphasizes the simplicity of the system and its capability to adjust fan speeds automatically based on temperature and humidity levels. The authors also explore potential IoT applications for remote monitoring and control of such systems in smart homes**.**

Sharma, A., & Verma, T. "Integration of DHT11 Sensor with Arduino for Smart Cooling Systems." (2024):

This work introduces an IoT-enabled home automation system incorporating fan speed control using Arduino. The authors used temperature sensors, Arduino Nano, and Wi-Fi modules to allow real-time monitoring and control through mobile applications. This paper emphasizes user convenience and energy efficiency in smart home environments.

CHAPTER 3

PROPOSED METHOLOGY

3.1 BLOCK DIAGRAM

1 PROPOSED METHOLOGY

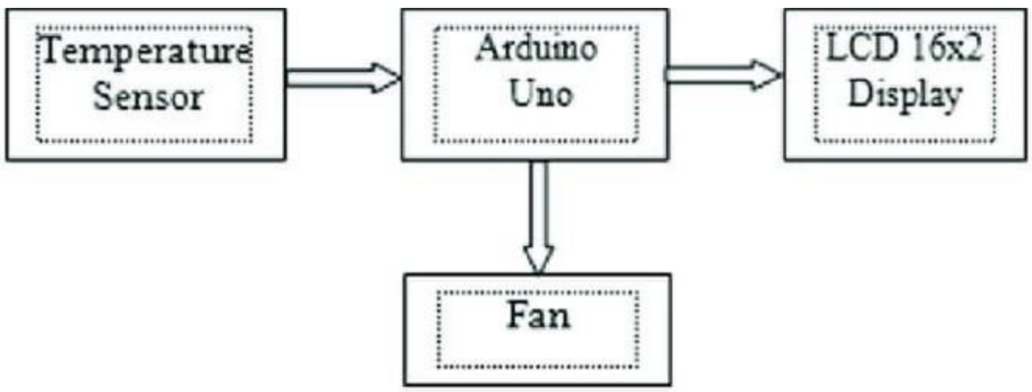


Fig:3.1 Block Diagram

DESCRIPTION

1. Temperature Sensor:

Function: Measures the ambient temperature of the environment. It serves as the input to the system.

Connection: Sends the temperature data as an analog or digital signal to the Arduino Uno for processing.

2. Arduino Uno:

Role: Acts as the microcontroller and the central processing unit of the system. It processes the data received from the temperature sensor and takes actions based on predefined conditions or thresholds.

Functions:

Reads the temperature data from the sensor.

Performs computations to compare the measured temperature with a predefined value (setpoint).

Controls the output devices (fan and display) based on the results of the computations.

Connections:

Receives input from the temperature sensor

Sends output signals to both the LCD 16x2 display and the fan.

3. LCD 16x2 Display:

Function: Displays the current temperature or system status, such as "Cooling Active" or "Temperature Normal." It provides a visual interface for the user to monitor the system's operation.

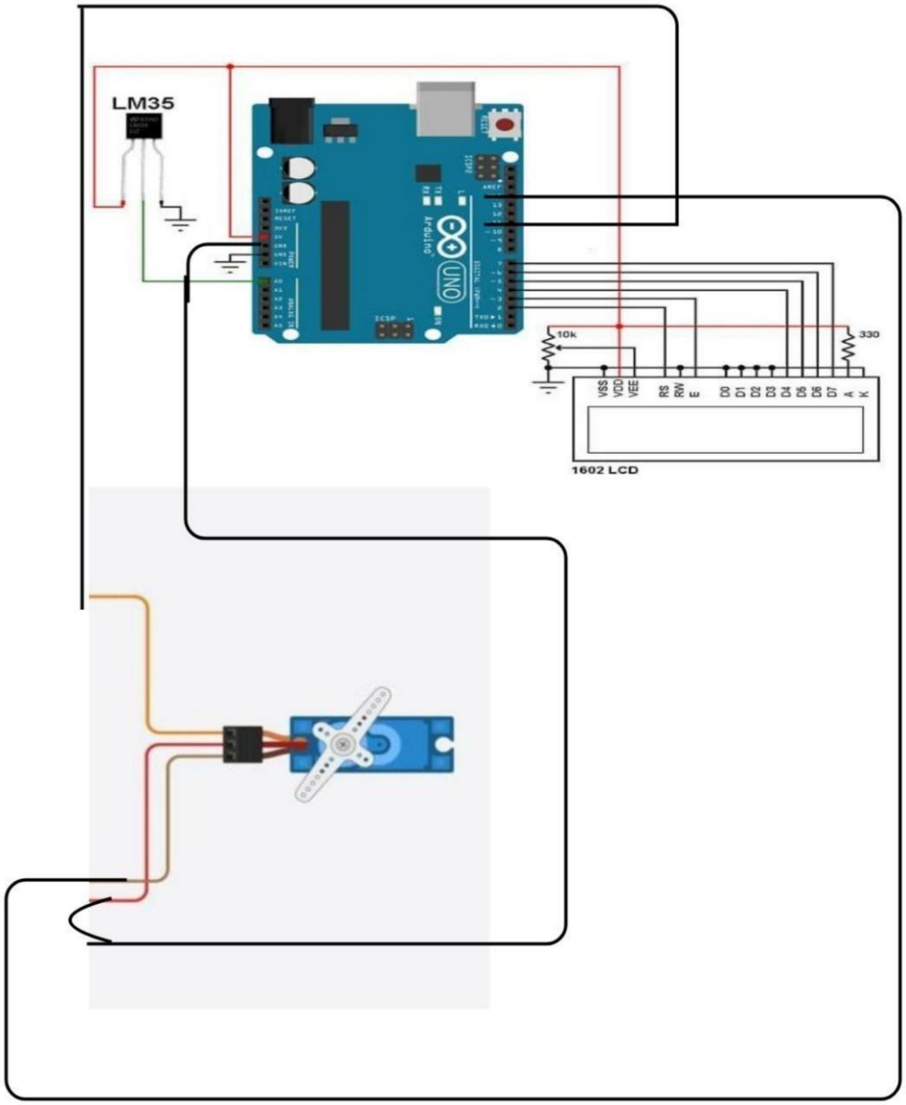
Connection: Controlled by the Arduino Uno, which sends it the relevant data to display.

4. Fan:

Function: Serves as the output device to regulate temperature. If the measured temperature exceeds the set threshold, the fan is activated by the Arduino Uno to cool down the system or the surrounding area.

Connection: Controlled via a digital output signal from the Arduino Uno.

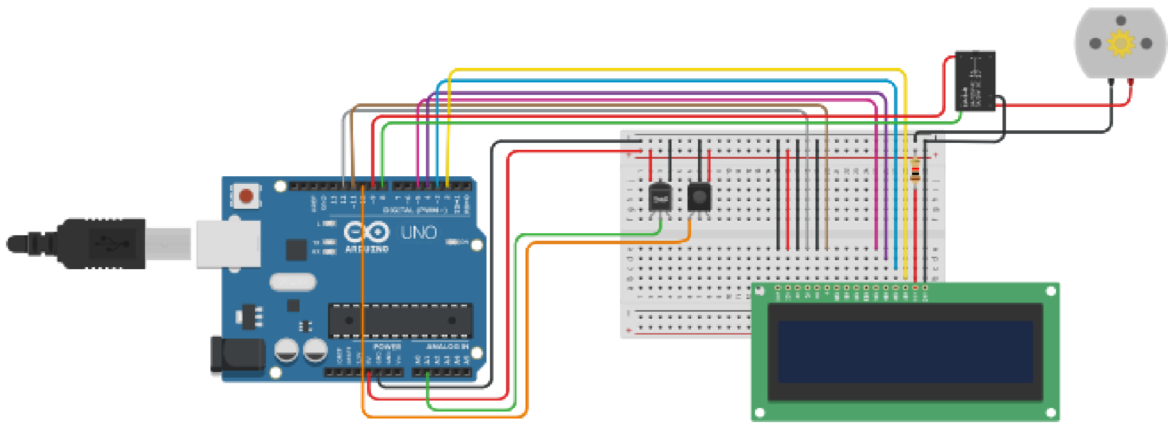
3.3 Circuit diagram



CHAPTER 4

RESULT AND DISCUSSION

4.1. SIMULATION OUTPUT



4.2. HARDWARE COMPONENTS DESCRIPTION

ARDUINO BOARD:

The Arduino microcontroller acts as the brain of the system. It processes signals from the water flow sensor, executes the logic to detect leaks and controls the servo motor to operate the valve. The Arduino is programmable, allowing for customization of thresholds and responses based on specific requirements.

2. LM35 TEMPERATURE SENSOR

Description: A precision temperature sensor with an analog output voltage directly proportional to the Celsius temperature.

Key Features:

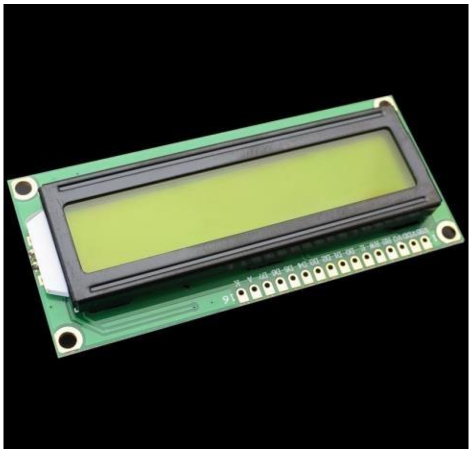
Output voltage: 10mV/°C.

Temperature range: -55°C to 150°C.

High accuracy and low self-heating.

Role in the Project: Measures ambient temperature and sends a voltage signal to the Arduino for processing.

3. 16x2 LCD Display



Description: A liquid crystal display capable of showing 16 characters per row across two rows. It is used to display real-time temperature and fan speed.

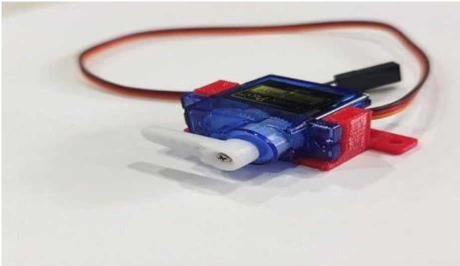
Key Features:

Operates at 5V.

Requires 6 digital pins for data and control.

Role in the Project: Displays feedback, such as the current temperature and fan speed percentage.

4. Servo Motor (SG90)



Description: A small and lightweight motor capable of precise angular rotation, commonly used in automation projects.

Key Features:

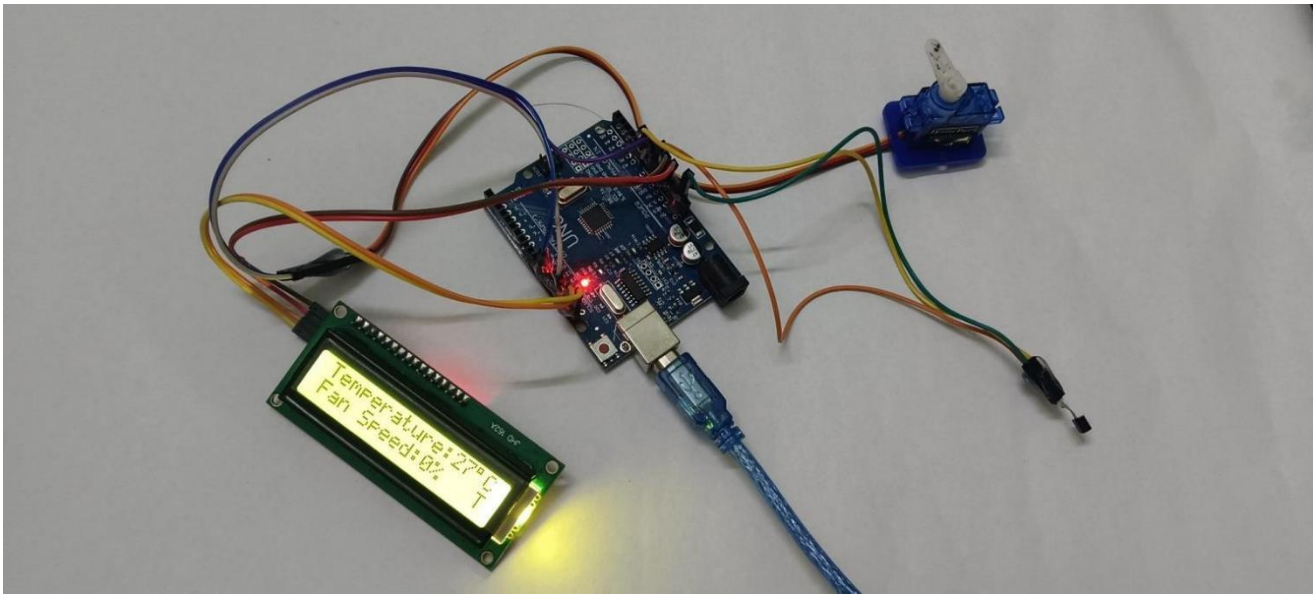
Operating voltage: 4.8V-6V.

Torque: 1.8 kg-cm.

PWM control for precise positioning.

Role in the Project: Optionally adjusts airflow direction based on temperature conditions.

4.2. HARDWARE EXPERIMENTAL SETUP



CHAPTER 5

CONCLUSION

The **Temperature-Based Fan Speed Control and Monitoring System** successfully demonstrates a cost-effective, energy-efficient, and automated method of controlling fan speed based on temperature changes. By integrating an Arduino microcontroller, an LM35 temperature sensor, and a 16x2 LCD, the system provides precise control and real-time monitoring, ensuring optimal performance in both domestic and industrial applications. This project highlights the advantages of using a microcontroller-based approach for automation, including accuracy, adaptability, and user convenience. The inclusion of an SG90 servo motor further adds to the system's flexibility, enabling dynamic airflow direction adjustments. This project effectively reduces manual intervention, conserves energy, and improves thermal comfort.

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ANNUXURE 1

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(7,6,5,4,3,2);

int tempPin = A1;

int fan = 11;

int led = 8;

int temp;

int tempMin = 30;

int tempMax = 60;

int fanSpeed;

int   fanLCD;

void setup() {

  pinMode(fan, OUTPUT);

  pinMode(led, OUTPUT);

  pinMode(tempPin, INPUT);

  lcd.begin(16,2);

  Serial.begin(9600);

}

void loop()

{

   temp = readTemp();


if(temp < tempMin)
```

```
  {
     fanSpeed = 0;
     analogWrite(fan, fanSpeed);
     fanLCD=0;
     digitalWrite(fan, LOW);
  }
  if((temp >= tempMin) && (temp <= tempMax))
  {
     fanSpeed = temp;
fanSpeed=1.5*fanSpeed;
     fanLCD = map(temp, tempMin, tempMax, 0, 100);
     analogWrite(fan, fanSpeed);
  }
  if(temp > tempMax)

 {
    digitalWrite(led, HIGH);
    }
  else
    {
    digitalWrite(led, LOW);
    }

 lcd.print("TEMP: ");
```

```
  lcd.print("TEMP: ");
  lcd.print(temp);
  lcd.print("C ");
  lcd.setCursor(0,1);
  lcd.print("FANS: ");
  lcd.print(fanLCD);
  lcd.print("%");
  delay(200);
  lcd.clear();   }
int readTemp() {
  temp = analogRead(tempPin);
  return temp * 0.48828125;
}
```