# Project Report

## Automatic Exhaust Fan Control System with Temperature Monitoring using Arduino

### Abstract:

The "Automatic Exhaust Fan Control System with Temperature Monitoring using Arduino" is a practical and energy-efficient project that aims to automatically control an exhaust fan based on room temperature. By utilizing an Arduino Uno, an LM35 temperature sensor, a 16x2 character LCD display, and a relay module, this project demonstrates how technology can be used to improve comfort and energy conservation in indoor spaces.

### Objectives:

- Create a system that monitors room temperature using the LM35 sensor.

- Display the current temperature on a 16x2 character LCD display.

- Automatically control an exhaust fan using a relay module based on the temperature threshold.

- Promote energy conservation and maintain a comfortable indoor environment.

### Materials Used:

- Arduino Uno

- LM35 temperature sensor

- 16x2 character LCD display

- Relay module

- Exhaust fan

- Diode (1N4007)

- Potentiometer (10k ohm)

- Breadboard and jumper wires

- Power supply for the fan (if required)

### Methodology:

#### Circuit Connections:

1. Connect the LM35 temperature sensor to the Arduino:

- VCC to 5V on the Arduino.

- GND to GND on the Arduino.

- OUT to Analog Pin A0 on the Arduino.

2. Connect the relay module to control the exhaust fan:

- VCC and GND of the relay module to 5V and GND on the Arduino.

- IN1 (or signal) of the relay module to a digital pin (e.g., D2) on the Arduino.

3. Connect the NO (Normally Open) and COM (Common) terminals of the relay to the power supply of the exhaust fan.

4. Add a diode (1N4007) in parallel with the relay coil:

- Anode (non-striped side) to the positive terminal of the relay coil.

- Cathode (striped side) to GND on the Arduino.

5. Install a 10k ohm potentiometer for LCD contrast adjustment:

- Connect one end to 5V on the Arduino.

- Connect the other end to GND on the Arduino.

- Connect the center pin (wiper) to the LCD's VO (Voltage Out) pin.

6. Connect the 16x2 character LCD display:

- RS (Register Select) pin of the LCD to digital pin 12 on the Arduino.

- E (Enable) pin of the LCD to digital pin 11 on the Arduino.

- D4, D5, D6, and D7 pins of the LCD to digital pins 5, 4, 3, and 2 on the Arduino, respectively.

- VSS (Ground) pin of the LCD to GND on the Arduino.

- VCC (Power) pin of the LCD to 5V on the Arduino.

#### Programming:

- Upload the provided Arduino code to the Arduino Uno.

- The code reads the room temperature from the LM35 sensor, displays it on the LCD, and controls the exhaust fan via the relay module based on a set temperature threshold.

- A potentiometer allows for adjusting the LCD contrast.

### Results:

- The system effectively monitors and displays the current room temperature on the 16x2 character LCD display.

- When the temperature exceeds the threshold (set at 30.0°C in the provided code), the exhaust fan is automatically turned on via the relay module.

- The system promotes energy conservation by running the fan only when necessary, thus maintaining a comfortable indoor environment.

### Conclusion:

The "Automatic Exhaust Fan Control System with Temperature Monitoring using Arduino" is a successful project that demonstrates the application of technology in promoting energy conservation and enhancing indoor comfort. The project showcases how Arduino, combined with various components, can be used to create practical and efficient solutions for everyday challenges.

### Future Enhancements:

1. Implement more advanced control algorithms, such as hysteresis, to prevent frequent fan cycling.

2. Integrate Wi-Fi or Bluetooth connectivity for remote monitoring and control.

3. Explore the use of multiple temperature sensors for improved accuracy in larger spaces.

4. Add a real-time clock (RTC) module to schedule fan operation at specific times.

By continuously improving and expanding upon this project, it can become an even more versatile and effective solution for energy-efficient temperature control in various settings.

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Feel free to customize this project report as needed, including adding images, charts, or further details about your project. This report provides a structured overview of your project, its objectives, materials, methodology, results, and potential future enhancements.