Department of Computer and Software Engineering

CE151L: Electronic Devices and Circuits Lab

Lab Project

DC Fan Speed Controller Based on Temperature

Submitted by:

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Requirements:

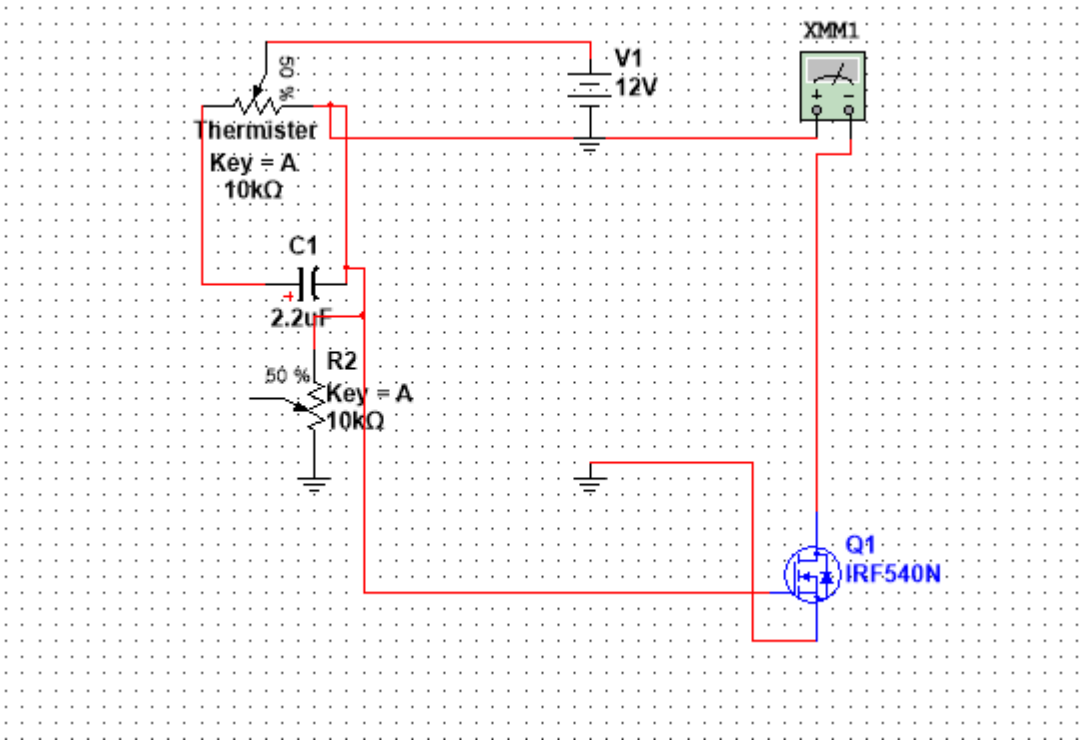
This project is to design a DC fan speed controller that adjusts the speed of the fan with change in temperature. This is achieved using a thermistor to sense the temperature changes and a MOSFET to control the fan speed. The fan remains off at room temperature (approximately 35°C) and begins to turn on as the temperature rises, increasing in speed as the temperature continues to rise.

Components Selection:

- Thermistor (10k ohm) x1
- Capacitor (2.2uF, 50V) x1
- Potentiometer (10k ohm) x1
- MOSFET (IRF540N) x1
- DC Fan x1
- Power supply (12V)

Circuit Design & Working:

Design:

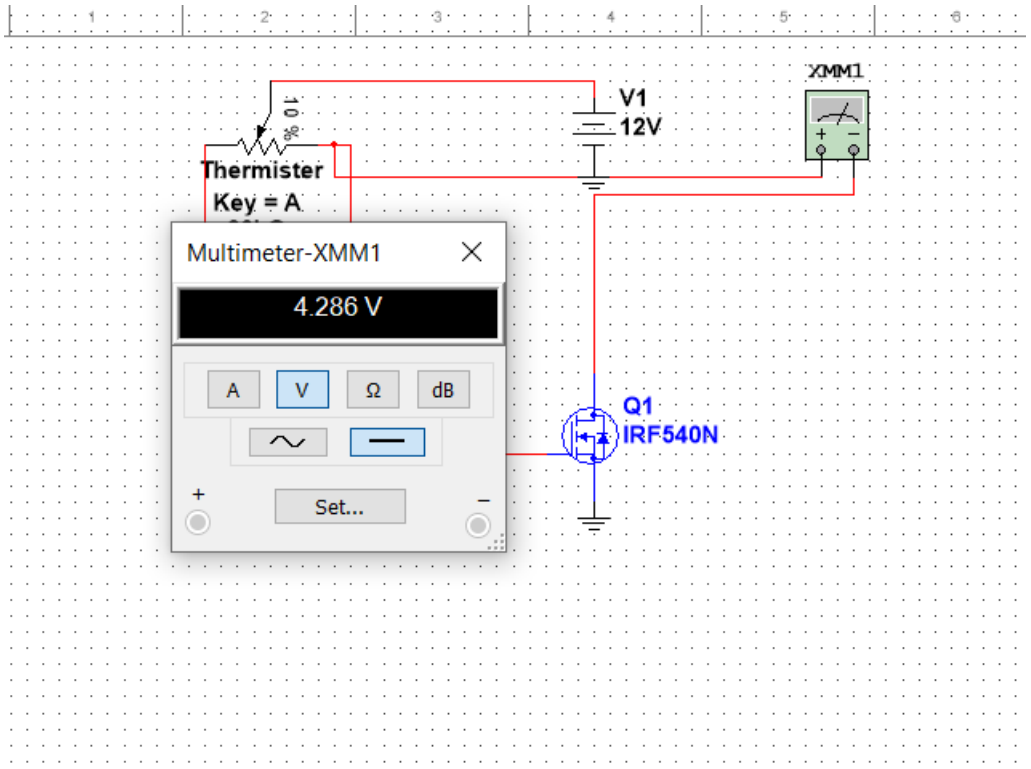


Working:

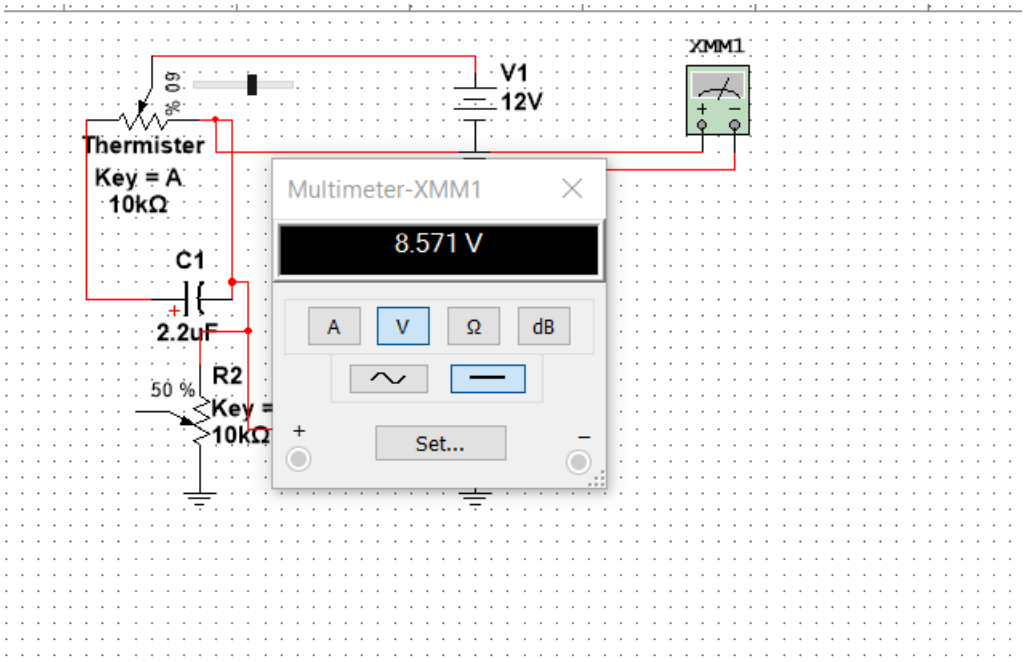
The temperature-based DC fan speed controller operates by utilizing a thermistor whose resistance varies with temperature. At room temperature, the thermistor has a higher resistance, preventing the fan from turning on. As the temperature rises, the resistance of the thermistor decreases, which causes an increase in the voltage across it due to the voltage divider configuration with a fixed resistor. This changing voltage is applied to the gate of an IRF540N MOSFET, which controls the current flow to the DC fan. A potentiometer is used to set the threshold temperature at which the fan starts operating. As the temperature continues to increase, the voltage across the thermistor further increases, enhancing the gate-source voltage of the MOSFET, thus allowing more current to flow through to the fan. This results in a gradual increase in the fan's speed, correlating with the temperature rise. Conversely, as the temperature decreases back to room temperature, the resistance of the thermistor increases, leading to a decrease in the voltage across the MOSFET and consequently reducing the fan speed until it turns off. The circuit is powered by a 12V DC supply, providing the necessary voltage for the fan's operation.

Simulation Results:

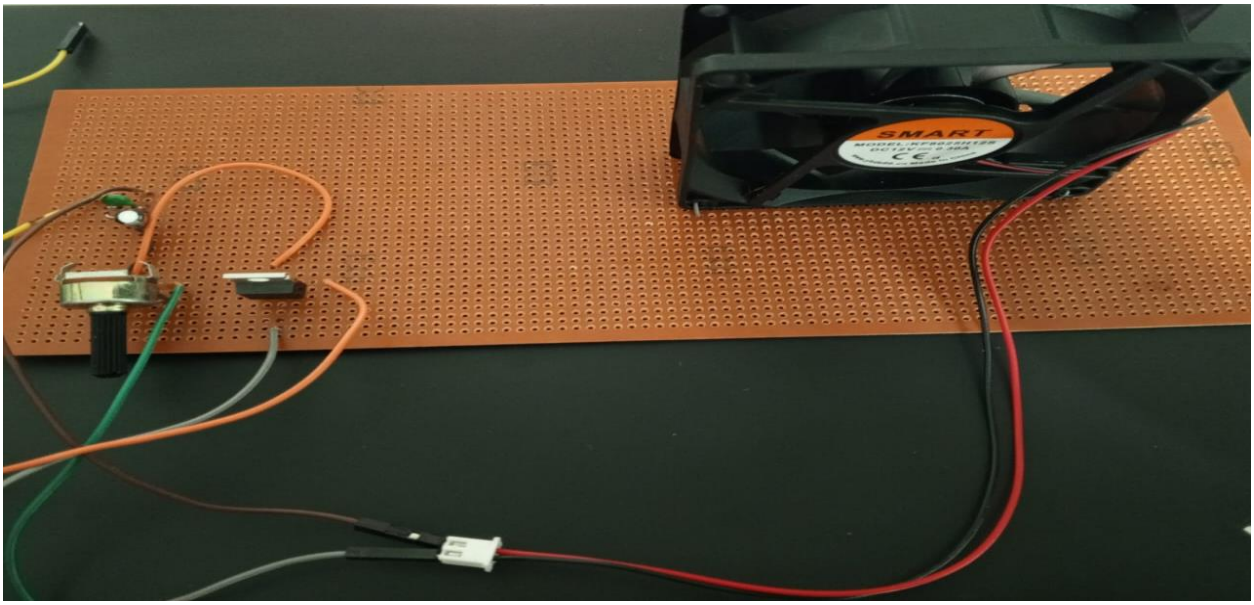
- Voltage across fan is low with no temperature applied across thermister (resistance is high)

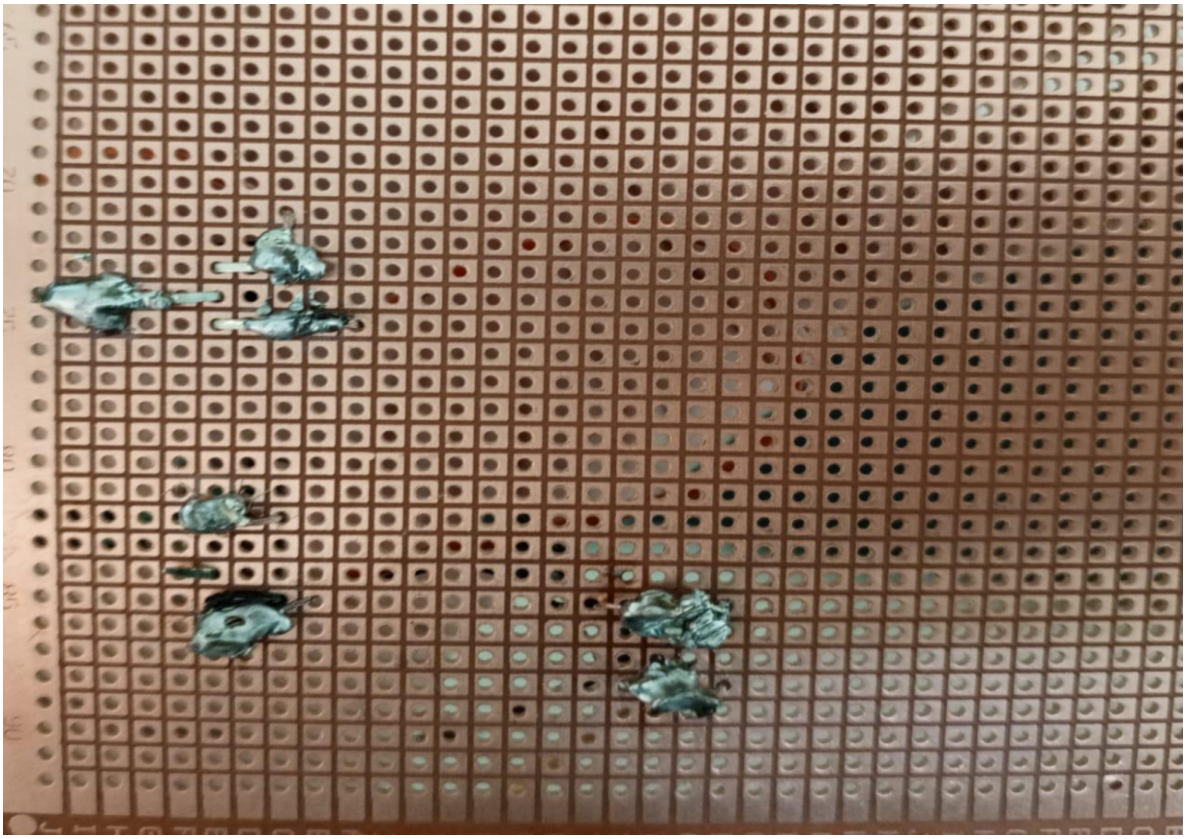


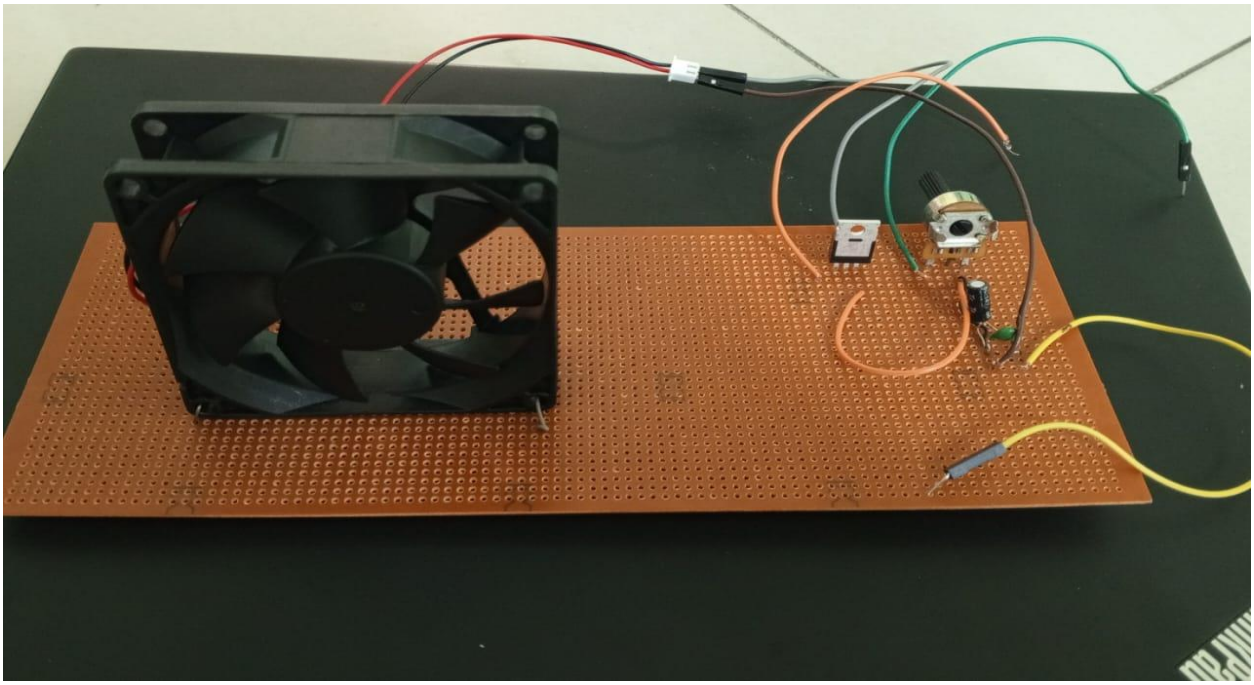
- Voltage across fan is high when is temperature applied across thermister (resistance is low)



Hardware Implementation:







Results:

This circuit is working properly, at room temperature and below the fan stays off but as the temperature increases the fan starts working and its speed slowly increases with temperature.