Assignment 1: Smart Thermostat

Overview

Build a smart thermostat to control the temperature in your home.

Directions

Build a smart thermostat using an Arduino. The device should read the current temperature from an analog temperature sensor and decide whether the furnace or air conditioner must be turned on.

Start by connecting the temperature sensor to the Arduino and print the current temperature to the serial monitor. The temperature reading will need to be converted to degrees Celsius. Print a new reading every 5 seconds.

Next add furnace and air conditioning controls. Represent the furnace by a red LED and the air conditioning by a green LED. If the current temperature is more than 5°C above the desired room temperature, the air conditioning should be turned on; If it is more than 5°C below the desired room temperature, the furnace should be turned on. For example, if the desired room temperature was set to 20°C, the air conditioning would be on for temperatures above 25°C, and the furnace would be on for temperatures below 15°C.

Add a potentiometer as an analog input to adjust the desired temperature between 0°C and 30°C. Print the desired room temperature to the serial monitor every 5 seconds along with the current temperature reading.

You must build this device either in Tinkercad, or using your Arduino kit. If you are building it with the kit, you may want to simulate it in Tinkercad first anyway just to test the voltages being used are correct.

Demo your working device for your instructor and submit a sketch of your design along with the Arduino code to the dropbox.

Evaluation

This assignment will be graded for both design and functionality.

The design component will be evaluated as follows:

Design Task	Marks

Diagram and design
   ○ **Is the design diagram clear?**
   ○ **Does the design work?**
   ○ **Are devices used within standard working ranges?**
	20

Code quality
   ○ **Is the code clear and easy to read?**
   ○ **Is the style consistent?**
   ○ **Are comments used when necessary?**
	20

Total	40

Design tasks are worth 20 marks each, but will be assigned a grade of 20, 15, 10, 5, or 0. The diagram is primarily for helping communicate your project's design. It should include enough to show how your device is built.

Functional tests will check for the following features:

Functionality Task	Marks
Current temperature printed to serial monitor	20
Furnace activated correctly	10
Air conditioning activated correctly	10
Potentiometer adjusts desired temperature	10
Desired temperature printed to serial monitor	10
Total	60

Bonus

Most smart thermostats will either be setting to heating mode or cooling mode: in heating mode, the furnace can be turned on if the temperature is low enough, but the air conditioning will not be turned on if the temperature is high. Add a push button as a digital input to your device. When the button is pressed, the device toggles between heating mode, cooling mode, and climate control (which turns allows both furnace and air conditioning to be used). Print the current mode to the serial monitor every 5 seconds along with the desired and current temperature. When the button is pressed, make sure the device doesn't change modes again until the button is released. Also make sure the button press can occur at any time and be registered accurately by the device.