

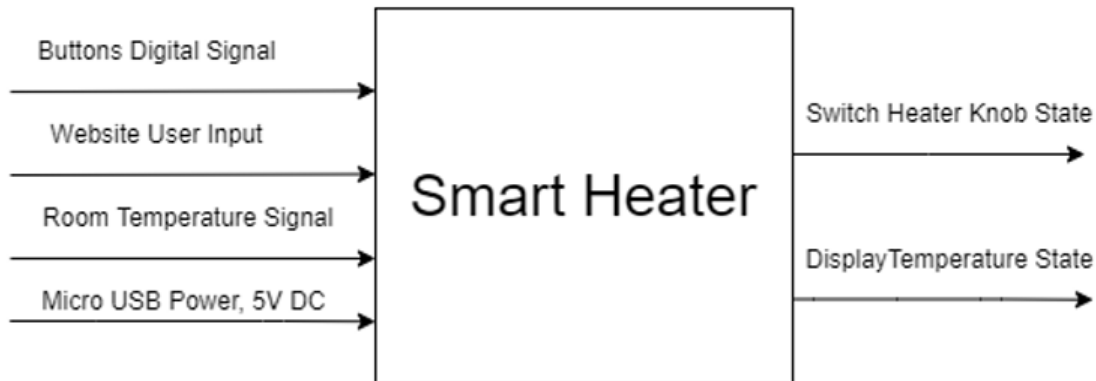
ECE 411 Team 3

Functional Decomposition for the Smart Heater System

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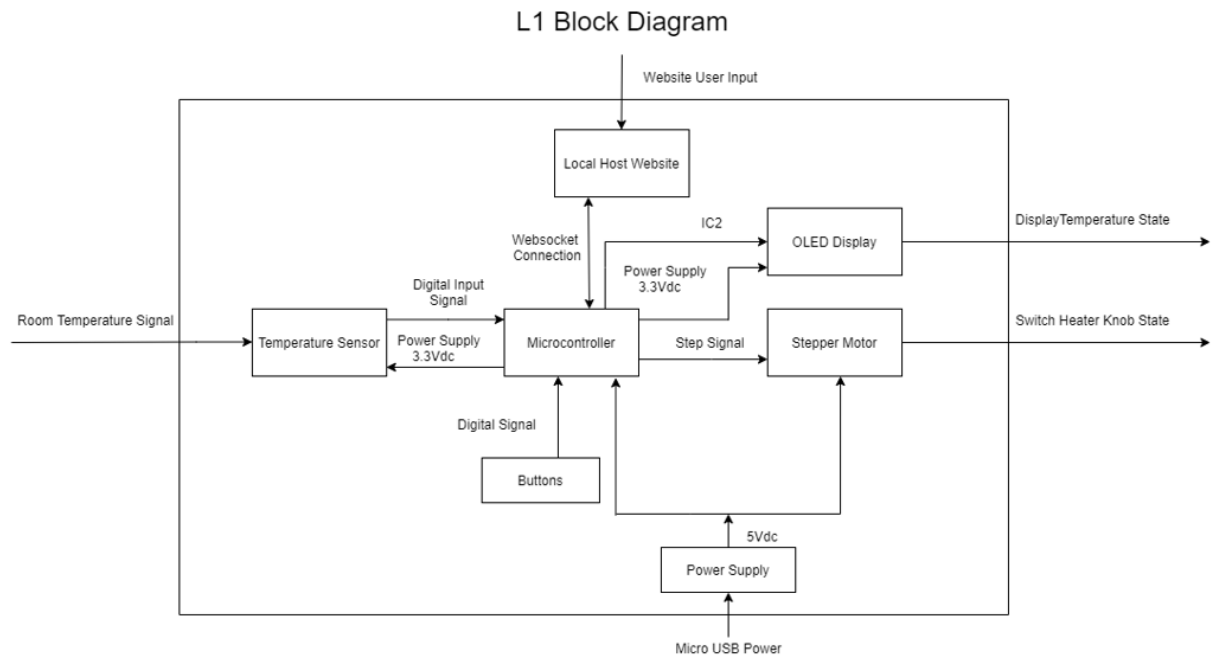
Level 0 Block Diagram

L0 Block Diagram

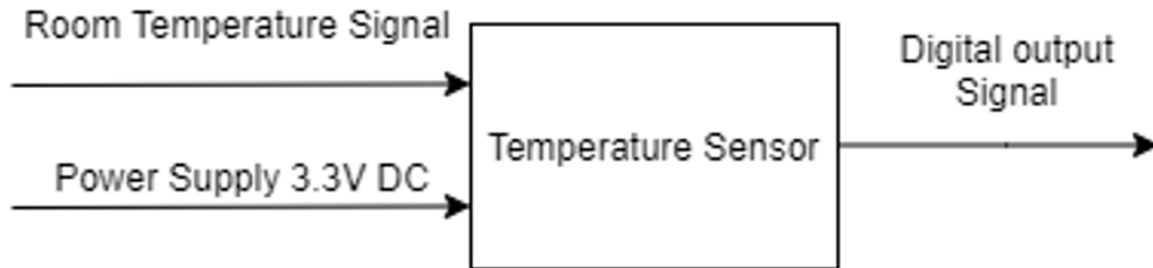


Module	Smart Heater
Inputs	Power: 5V dc. Buttons: Sends a digital signal to apply the settings desired by the user Room Temperature Signal: Sends a digital signal of ambient temperature and humidity Website User Input: Local website send user input data and getting feedback from microcontroller to declare when to turn the knob
Outputs	DisplayTemperature State: Smart heater sends data using the I2C protocol to the OLED screen to display temperature state Switch Heater Knob State: The stepper motor receives a digital signal turning the knob position.
Functionality	The Smart Heater turns the knob on a heater unit a certain amount of steps to turn the heater on or off. The start and end time for the system is determined by the user through the WebSocket website, as well as the desired room temp at that time. Buttons are used to set the start and end times of the system without going through the website. The ambient temperature and humidity of the room is also displayed on the OLED display screen for the user to read.

Level 1 Block Diagram

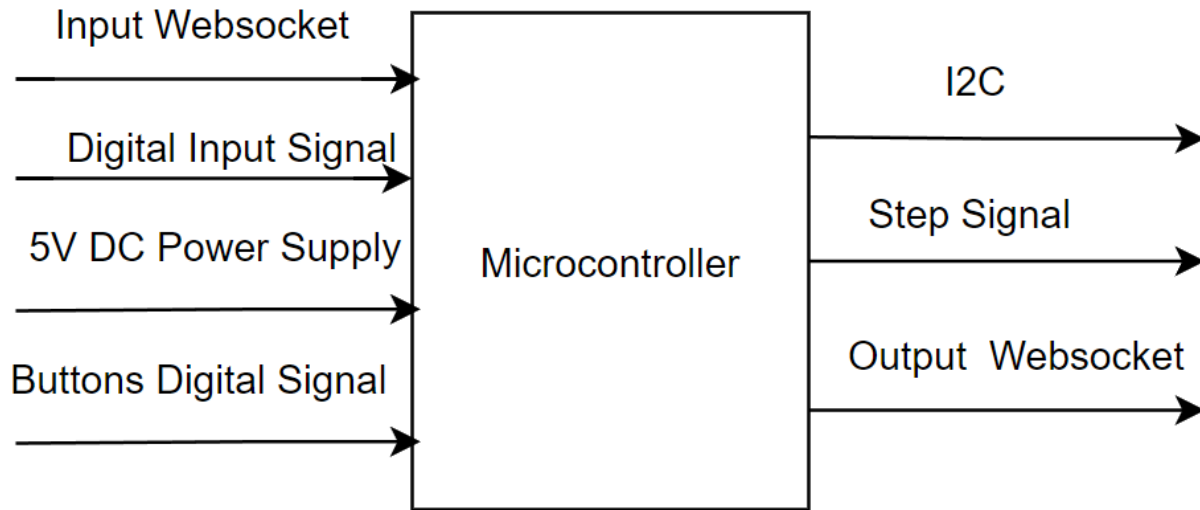


Temperature Sensor: Level 1



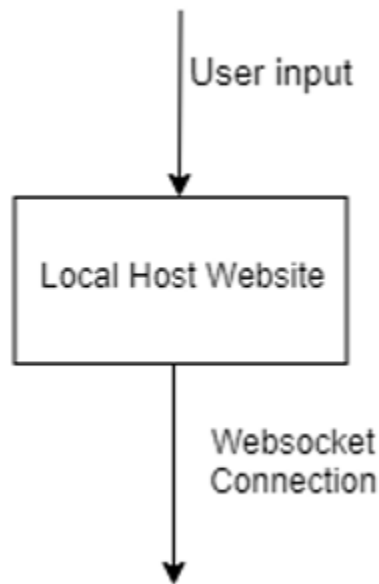
Module	Temperature Sensor
Inputs	Power: 3.3V dc from microcontroller Room Temperature Signal: Sends a digital signal of ambient temperature and humidity
Outputs	Digital output signal: Get the current temperature and humidity data from the sensor, and send a digital signal to the microcontroller.
Functionality	Sensing the surrounding temperature and sending a digital signal to the microcontroller

Microcontroller: Level 1



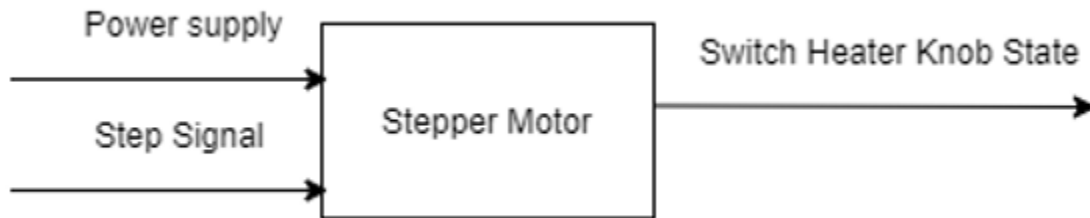
Module	Microcontroller
Inputs	Input Websocket : Local website sends user input data to declare when to turn the knob Digital input signal : Ambient temperature data from the temperature sensor, to be used to compare the ambient temperature with the set temperature to determine whether it is consistent Power supply : 5V DC Buttons : Manually control smart heater switch, timer
Outputs	I2C : Sends data for the OLED screen to display temperature state Step signal : Signal sent to the stepper motor to change the knob position Output websocket : Microcontroller establishes WebSocket Connection to setup the local website
Functionality	The microprocessor can complete operations such as fetching instructions, executing instructions, and exchanging information with external memory and logic components

Local Host Website: Level 1



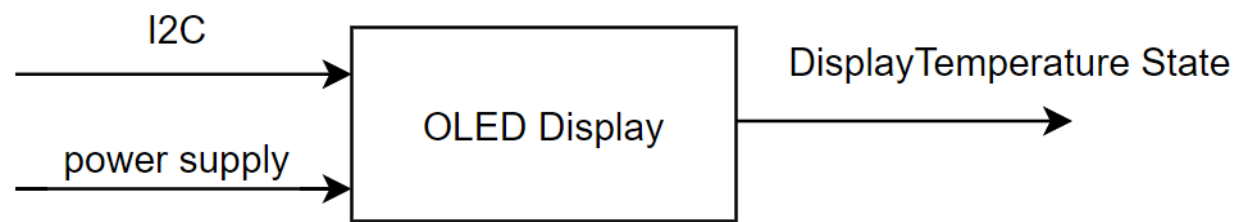
Module	Local host website
Inputs	User Input: The user gives instructions to the webpage by visiting the webpage, choosing the temperature and starting time the user would like.
Outputs	Websocket connection: Local website sends user input data through the Websocket connection to the microcontroller, thus communicating the desired start and end times for the heater to be turned on.
Functionality	Our project hopes to showcase the “smartification” of the heater through web design. The user gives instructions to the webpage to get the function they desire.

Stepper Motor: Level 1



Module	Stepper motor
Inputs	Power: 5Vdc Step signal: Send a continuous and stable signal to the motor to make the motor rotate
Outputs	Switch heater knob state: The stepper motor receives the step signal, turning the knob position.
Functionality	The motor has a gear system attached to it so that it has enough torque to rotate the heater system control knob.

OLED Display: Level 1



Module	OLED display
Inputs	Power: 3.3V DC Voltage I2C: The data from the microcontroller telling the OLED screen what to display
Outputs	Display temperature state: OLED Screen displays the current temperature and humidity information of the room.
Functionality	The OLED Screen displays the current temperature and humidity of the room according to the I2C protocol sent by the microcontroller.