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SNHU – CS499

7/17/25

Milestone 2

The artifact is a Python-based thermostat control system developed for a Raspberry Pi, originally created during CS350: Embedded Systems. The project was developed in Spring 2025 and is designed to read real-time temperature and humidity data from sensors, control a heating or cooling mechanism using GPIO pins, and display status information on an LCD. It also supports user input via buttons to cycle thermostat modes and adjust temperature setpoints.

I selected this artifact for my ePortfolio because it demonstrates a solid application of embedded systems programming, sensor integration, GPIO control, and user interaction on a microcomputer platform. These are real-world, applied software engineering skills that reflect a professional-grade understanding of hardware-software interfacing and control systems design.

This artifact shows my ability to:

* Design a state machine architecture for hardware control
* Interact with physical sensors (DHT11) and display units (LCD)
* Modularize and document Python code for readability and future extensibility
* Implement user input and feedback loops via GPIO buttons and serial output

The artifact was further improved by refactoring it for modular design, improving commenting and documentation, and preparing the codebase for future enhancements, including misting control and database integration.

I would say I met the outcomes I initially targeted, including:

* Designing and evaluating computing solutions using software engineering practices (i.e. modularization, embedded systems architecture)
* Using innovative techniques and tools in computing, such as sensor interfacing and GPIO management in Python
* Delivering technically sound, professional documentation and code through inline comments, class-based structure, and clearly defined roles for each component

At this point, I have no updates to my outcome-coverage plans; the enhancement aligns closely with my original goals. If you see any improvements, please let me know. I did quite a lot of restructuring for the updated artifact.

Enhancing the artifact taught me how to take an academic prototype and develop it toward a more maintainable, extensible, and professional-grade system. Refactoring the code into modular components not only improved clarity but also paved the way for integrating advanced functionality in the future (e.g., humidity control, database integration).

One of the challenges I faced was structuring the control flow and logic to be flexible enough for future extensions, such as user profiles or multi-sensor setups. I also had to carefully manage GPIO setup and hardware timing, as incorrect handling could lead to inaccurate readings or inconsistent hardware behavior. Through these challenges, I deepened my understanding of hardware-software timing and sensor reliability.