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Milestone Three Narrative

The artifact I selected for this milestone is the Raspberry Pi thermostat project that I originally created during CS 350. The project combines a breadboard circuit, tactile buttons, LEDs, an LCD screen, and a temperature sensor connected to a Raspberry Pi. The code uses a state machine to manage the thermostat’s operating modes of off, heat, and cool, while giving feedback through LEDs and a display. For this milestone, I continued working on the artifact by enhancing the way the program makes decisions about temperature and setpoints.

I included this artifact in my ePortfolio because it represents the connection between software and hardware, and it shows that I can apply algorithmic thinking to solve practical problems. The improvements I made in this milestone directly highlight my skills in working with algorithms and data structures. I introduced a moving average filter to smooth the sensor readings so that the system would not react to small fluctuations in temperature. I also added a hysteresis band around the setpoint so that the output does not chatter when the temperature hovers near the threshold. Finally, I implemented a daily schedule that uses a binary search over sorted time intervals to select the proper setpoint automatically. These changes transformed the thermostat from a simple reactive system into one that applies structured logic and efficient data handling to deliver more stable and predictable behavior.

In Module One, I planned to meet the course outcome related to designing and evaluating computing solutions using algorithmic principles. With Version 3 of this project, I achieved that outcome by choosing algorithms that improved both performance and stability. The moving average and hysteresis provide efficiency and resilience against noisy inputs, while the schedule demonstrates the ability to organize and search structured data. My original coverage plan remains on track, and the next milestone will focus on databases to complete the final category.

The process of enhancing this artifact reminded me that selecting the right algorithm is not just about efficiency but also about matching the algorithm to the problem. For example, a binary search is a simple structure, but in this context it is a perfect fit because it keeps lookups fast and predictable while keeping the code clean. I also learned that even small changes in control logic can make a big difference when hardware is involved. The main challenge I faced was balancing the new functionality with the need to keep the system reliable. It is easy to introduce complexity that looks good in theory but creates unintended behavior on a live system. I had to be careful to test each change thoroughly and to think about how the algorithms would interact with both the physical circuit and the user experience. That process helped me grow more confident in integrating algorithms into practical, embedded systems.