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Final Narrative

For my capstone project, I decided to dive deeper into my CS-350 Thermostat final project and enhance it. I was looking through all my old projects and instead of trying to pick three separate past projects, I saw my old thermostat project and thought, what if I am able to include all three requirements of software design, algorithms, and database integration? I then had the idea to enhance the original project into two parts: A simulation-enhanced version that worked inside of VS Code, and the same program, but it works through the Raspberry Pi device as a real-life thermostat that illustrated software design and engineering, algorithms and data structures, and database integration. The simulation version uses mock sensors and actuators, but also still applies thermostat logic with hysteresis and logs all readings, inputs, state changes, and settings into a SQLite database that is safe and acts as a portable simulation of a thermostat.

The Pi device version extends the concept into an embedded system. This allows for real-life for the thermostat program. It has all the same functions as the thermostats we have in our homes. It has the pigpio library for controlling the relays, reads input from real buttons, and at the same time collects real-time temperature and humidity. The logic behind the thermostat adjusts outputs based on the sensor's feedback, hysteresis thresholds, and the user-defined set points. This allows the program to showcase real-world algorithmic applications and system control. The program logs all readings, settings, and system events into a local SQLite database for persistence and data analysis, which allows verification through queries. Both of the versions of the thermostat project showcase the complete Software Development Lifecycle, including abstract algorithm design, a database-driven handling of low-level hardware interaction, and system interaction on an IoT platform.

This project allowed me to showcase my ability to take a simple project, plan and implement algorithms, database integration, and software design from start to finish, then complete it with it working on a real-life device. In the original thermostat project, it had buttons that would change it from cool to heat to off. It had a slider-type button to adjust the LCD display's brightness. I saw the opportunity to enhance the project and was able to do so successfully. Working on this project was a lot of work. I would say the planning part almost took as long as coding the project. The simulation did not take as long, but the PI device portion took a very long time to complete compared to other projects I have done in my years attending SNHU. I would say the hardest part was debugging the code for the PI device. Much like in my class, where I last used the PI device, it is very tedious to set up and to ensure you have everything in the right place. I also had problems with the database not wanting to install correctly on VS Code at first, but I was able to work through that. The artifact that I have now is a fully functioning thermostat compared to the simple one that it was before, along with a fully functioning desktop thermostat.