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07/20/2025

CS 499 Computer Science Capstone

Professor Wasim Alim

3-2 Milestone Two: Enhancement One: Software Design and Engineering

For my enhancement, I selected a Python-based thermostat control system originally built on a Raspberry Pi platform, developed during my CS-350 course, Emerging Systems Architectures and Technologies. The original artifact integrates a temperature and humidity sensor via I²C, uses a finite state machine for environmental control, and manages GPIO components such as LEDs and buttons. It also includes serial communication and an LCD interface, demonstrating modular design and logic.

I chose this artifact for my ePortfolio because it exemplifies the foundational and advanced skills I’ve gained in embedded systems programming, including state machine architecture, sensor data processing, and real-time user feedback. To enhance it, I translated the core control logic into C++ for microcontroller deployment, simulating LED feedback and temperature handling on constrained hardware platforms like Arduino. This enhancement emphasizes cross-platform development and design adaptability, shifting the system from a high-level scripting language to a low-level, performance-sensitive context.

I demonstrated course outcomes related to designing computing solutions using algorithmic principles and delivering real-world implementations that meet industry goals. The enhancement reflects my ability to engineer software that balances clarity, precision, and hardware compatibility. I gained deeper insight into the trade-offs involved in resource management, timing control, and system feedback. Especially while rethinking Python’s dynamic threading model in C++'s more procedural environment. One of the more subtle but meaningful lessons was realizing how even small design decisions in embedded systems directly affect usability and reliability.