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CIS 450: Operating Systems
Final Project
12/10/2024

System Architecture:

The ESP-32-C3 device consists of many “.c” and “.h” program files. When compiled, they make up a fully functional device with many features. It has a built-in washing machine function that produces a sound when certain thresholds are reached, an LED brightness adjuster, and a thermostat program.

Concurrency Control Explanation:

We used xTaskCreate to create a new task for the announcement feature and separating it from the lighting control functions. Then we implemented a mutex function, provided by FreeRTOS, to lock and unlock the code segments where we performed the announcement calls, in protecting against race conditions. We also used event groups to signal which announcement was needed to be called upon based on the present lighting level.

User Guide:

- Turn the device on by plugging it into a power source such as a laptop.
- Rotate the knob until you are over the lighting function.
- Press the knob to access the lighting program.
- There will be an initial brightness level, along with a voice announcement.
- Rotate the knob to the left/right to decrease/increase brightness levels, respectively.
- Once the light level appears on the screen, there should be a voice announcing the new brightness level concurrently with the light change.