CIS 450: Operating Systems
Final Project

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Zackery Letourneau, Kenshin Yang,
Emmalyn Coon

System Architecture:

The ESP-32-C3 device contains many ".c" and ".h" program files. When compiled, they make up a fully functional device with many features. These features include a built-in washing machine function that produces a sound when certain thresholds are reached, an LED brightness adjuster for the built-in LED light, and a thermostat program with a variety of temperatures listed. It comes with a knob to cycle through and select these various functions.

Concurrency Control Explanation:

We used xTaskCreate to create a new task for the announcement feature and separate 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, which protects the software from having potential race conditions. We also used event groups to signal which announcement needed to be called upon based on the present lighting level, which was implemented using a switch statement.

User Guide:

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

Demonstration Video: https://www.youtube.com/shorts/xWBlRoioPo8

GitHub Link: https://github.com/Nenshki/CIS450-OS-Project.git