Scott Cain

6/14/2025

CS 350 Milestone Three Lab Questions

**Question 1: Why does the loop that processes the LED blinking need to run in a separate thread?**The LED blinking loop needs to run at the same time as other processes, like button presses and LCD updates. If Morse code transmission ran in the main thread, it would block those actions, making the system unresponsive. Running the loop in a separate thread allows the Morse sequence to continue uninterrupted while still accepting user input and updating the display. This ensures smoother operation where the system remains active and responsive instead of waiting for the transmission to finish before handling other interactions.

**Question 2: What is the purpose of returning to the off state after each completed state action?**Returning to the off state helps keep the timing correct in Morse code transmission. If the system didn’t reset between signals, the dots and dashes could run together, making the message unclear. The off state provides a necessary pause between signals, ensuring proper spacing and organization. It also helps maintain a structured state machine, allowing transitions to happen cleanly without confusion or errors. Without this reset, Morse signals might overlap, disrupting the intended pattern.

**Question 3: How could you integrate serial communications to facilitate changing the messages available to the program?**Serial communication would allow the program to receive new messages from an external source without requiring a button press. Using UART or USB, a connected device could send updated text directly to the Raspberry Pi, and the program could replace the current Morse message with the new one. This would make it possible to update the transmitted message remotely or through an automated system, creating a more flexible and adaptable setup. Instead of relying only on pre-programmed messages, serial communication would enable dynamic input, making the system more interactive.

**Question 4: How could you use the 16x2 display to provide debugging information to the user when they don’t have access to the application console?**The LCD display could serve as a useful debugging tool by providing live system information. It could show details like the current Morse character being transmitted, the active state of the program, and transitions between signals. This would make troubleshooting much easier when a computer monitor isn’t available. Instead of relying solely on console output, the LCD allows the user to check the system’s behavior directly from the device, ensuring clear visibility of what’s happening at any moment.