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PES Final Project Proposal

Functionality

For the course project I plan on developing an acceleration detector using the accelerometer and RGB LED on the FRDM-KL25z. The normal operation color for the RGB LED will be white. Upon detection of an acceleration that exceeds a user defined acceleration value, the RGB LED will change colors, indicating that the user defined value has been reached. When the acceleration drops below the selected value, the color of the RGB LED will revert back to white. The program should utilize the serial port to accept commands from the user. These commands should allow the user to set the acceleration value that will result in the LED color to change and allow the user to select which color the LED will change to. There should also be a command that enables prints of the current acceleration value every second. These prints should be able to be turned off by pressing any key on the user's keyboard.

Components

- I2C for accelerometer readings
- UART Command Processor
- RGB LED with PWM
- Circular Buffer

Resources

The main learning curve for me to implement this project is the I2C communication to the MMA8451Q accelerometer. The other components of the project will be familiar to me as we have used them in past assignments. However, I will still need to make modifications to those components in order to match my functional requirements. To learn how to implement I2C communication on the FRDM-KL25z board, I plan on using the Dean Textbook, the KL25Z Reference Manual, and the datasheet for the accelerometer.

Hardware

My project does not require any additional hardware.

Test Plan

The testing plan for my project will include a mixture of automated and manual tests. I will have automated tests for the circular buffer, but the tests for all other aspects of the program will be manual. The manual tests will consist of testing each user command in the UART command processor, and visually verifying proper functionality. Below are some examples of manual tests I will conduct.

- Input user command to set indication LED color to red and set acceleration target to $0 m/s^2$
    - LED should change colors from white to red
- Input user command to set indication LED color to green and set acceleration target to $0.5 m/s^2$, then move FRDM-KL25z board at an acceleration greater than $0.5 m/s^2$, then stop moving the board.

    - The LED should change from white to green, then back to white.
- Input user command to print acceleration values once per second. After five seconds, press any key
    - There should be 5 prints to the serial terminal with acceleration values, then the prints should stop after key is pressed.