Exercise Sheet 4
(20 Points)

Thursday, November 29, 2018

Note: This exercise lasts for two weeks. Please perform part A this week and part B next week on 06.12.2018.

Part A:

4.1 Advanced Stop Watch (10 points)

Modify your stop watch from exercise 2 - part B to have:
- Queues for task communication instead of global variables. Observe the accuracy of the watch.
- Interrupt service routine (ISR) to detect if the button is pressed instead of using polling.

Hint: To implement interrupts, use the `interrupts.h` and `gpio.h` libraries to perform the following necessary steps inside the `main` function:

a. Disable all the interrupts
b. Register the interrupt handler
   - Find the necessary Interrupt Request (IRQ) number from the data sheet, where the button is connected to `gpio_int[0].`
c. Enable GPIO detection
d. Enable the registered interrupt
e. Enable all the interrupts

Part B:

4.2 Priority Queues from Interrupt Service Routine (10 points)

Add the following operations to your implementation of priority queues from exercise 3 - part B:
- Send operation to be called from interrupt service routine.
- Receive operation to be called from interrupt service routine.

Part C - Bonus (5 points):

Modify your stop watch to consider the following:
- Interrupt service routine (ISR) to detect UART signals instead of using polling.
- While the ISR is processing an event, the system is able to detect up to 5 additional ones.