

Exercise Sheet 4

(20 Points)

Thursday, December 7, 2017

Note: This exercise lasts for two weeks. Please perform part A this week and part B next week on 14.12.2017.

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.