Exercise Sheet 2

(10 Points)

Thursday, October 25, 2018

Note: This exercise lasts for two weeks. Please perform part A this week and part B on 08.11.2018.

Part A:

2.1 Loading Kernel Image Over UART (1 point)

- What is *Universal Asynchronous Receiver-Transmitter (UART)*?

- Use the "raspbootin" boot loader to load FreeRTOS kernel image over UART. Plug the USB-UART dongle into the USB port of your computer and follow the steps in the README file.

2.2 Task Management (2 points)

- What is default tick for context switching in FreeRTOS, and how can it be changed?

- Explain the difference between vTaskDelay() and vTaskDelayuntil().

- Use the UART library to print and prompt characters using the serial port terminal.

- Modify the code of Exercise 1 to have:

  - Correct data types and naming according to FreeRTOS standards.
  - Delay functions instead of the empty for loops.
  - Two different tasks to control the buzzer and the led.

Part B:

2.3 Stop Watch (7 points)

Implement a stop watch in three tasks as follows:

- Display Task: This task updates the output. It does not require exact timing. It must not update any data variables.

- A Task to read the input: This task reads the input and updates the state of the state machine accordingly. The states are: Timer running, timer stop and timer clear.

- A task to keep track of timing: This task keeps track of the counter saving the timing information. This is the most timing critical task. As this task implements the core task of the "StopWatch", its accuracy is important.