LAB #4—Introduction to FreeRTOS

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1   LAB OBJECTIVES

- Introduce a real-time operating system FreeRTOS
- Understand how to use an RTOS to control digital outputs.
- Learn what tasks are and how to create them

Four LEDs are connected to an ATMega2560 MCU as follows:

- LED 1 (D1) is green and is connected to PB0 of the MCU
- LED 2 (D2) is red and is connected to PB1 of the MCU
- LED 3 (D3) is blue and is connected to PB2 of the MCU
- LED 4 (D4) is yellow and is connected to PB3 of the MCU
- A push button switch (SW1) is connected to PB4 of the MCU
- A push button switch (SW2) is connected to PB5 of the MCU
- A push button switch (SW3) is connected to PB6 of the MCU
- A push button switch (SW4) is connected to PB7 of the MCU

2   LAB EXERCISE

In this exercise, you're asked to write a program that read the digital input. Your program should work as follows:

- All LEDs are OFF at the start of the program
- Once the program begins, LED1 blink continuously at 1 Hz
- While the switch SW1 is pressed, LED2 is turned ON and stays ON until the switch SW1 is released.
- When SW2 is pressed and then released, turn ON LED3 for one second, and turn it OFF
- The program should also allow to control the blink rate of LED4 depending on how SW_3 and SW_4 are pressed. The program should work as follows:
    - At the beginning, LED4 starts blinking every second
    - If switch SW_3 is pressed, the blinking rate of LED 4 is multiplied by 2
    - If switch SW_4 is pressed, the blinking rate of LED 4 is divided by 2
    - The minimum flashing rate is 0.1Hz and the maximum flashing rate is 2Hz.

Use FreeRTOS to complete this lab exercise.