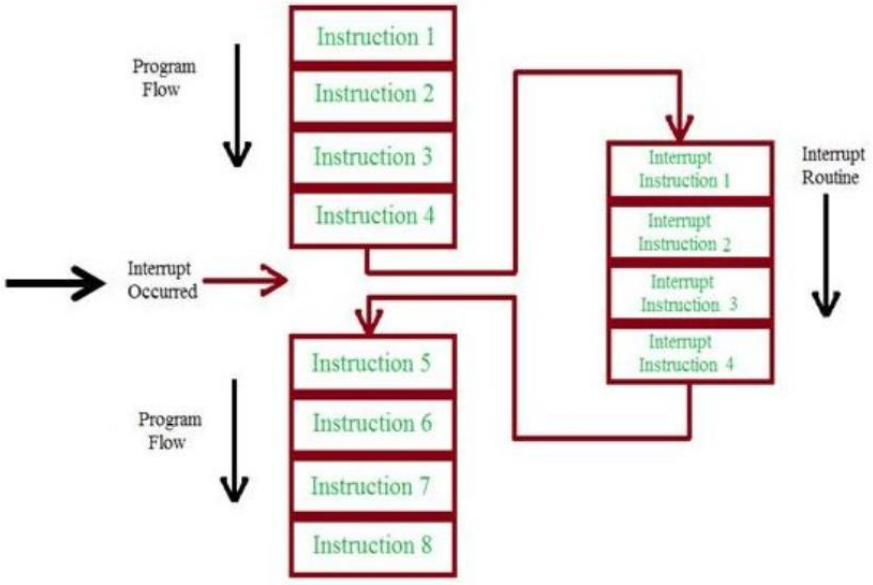
Assignment Interrupts



Semester 3 Embedded Systems

1 Introduction

Timers can be used to generate digital waveforms like PWM (Pulse Width Modulation) signals. These signals can be used for example to:

- Control a LED.
- Control a DC motor or servo motor.
- Control a heating element.

2 Assignment

In this assignment you will use interrupts to handle button presses. In this document we will use the acronym MCP for 'Manual Control Panel'. The MCP contains two buttons and two LEDs, labeled B0 and B1 for the buttons and LED0 and LED1 for the LEDs. A short press has a duration between 20 and 500 ms. A long press has a duration longer than 500 ms.

2.1 Requirements on your application

- A short press on B0 must turn on LED0
- A short press on B1 must turn on LED1
- A long press on B0 must turn off LED0
- A long press on B1 must turn off LED1
- A press shorter than a short press must be ignored
- Something cool like:
    - Connect a rotary encoder and use interrupts to count the number of ticks. See the datasheet of a rotary encoder in the Toolbox. You can use this to dim a LED or position a servo motor.
    - Etc.

2.2 Requirements on your code

- The code should be well structured and readable, without parts that are commented out.
- The code should follow the design described in your documentation.

2.3 Requirements on your documentation

The document should at least contain:

- A front page with your name.
- A short introduction.
- A connection diagram showing which sensors / actuators you use and to which pins they are connected.
- Some kind of design which is appropriate. This can be a flow chart, class diagram, a list or table with the peripherals you used and the used mode / settings etc.
- Test results. These can be screenshots of print outs, logic analyzer / oscilloscope / multimeter measurements.
- Short conclusion / reflection.

2.4 Additional information

- Make use of CMSIS for the implementation.

2.5 Hints

- To measure a time delay you may use the SysTick as used in the previous assignment to get the elapsed time in ms.

- To measure the button press time you can use external interrupts (EXTI). Important is how you connect the button, using a pull-down or a pull-up resistor. You have at least two options to determine the button press time:
    1. Set the interrupt to both falling and rising edge, and in the interrupt handler determine which edge triggered the interrupt. Record the time at each edge and calculate the difference in time between the two edges.
    2. In case of using a pull-down resistor: set the interrupt to falling edge first and after the first interrupt switch to rising edge. Record the time at each edge and calculate the difference in time between the two edges.

3 Delivery to Canvas

Please hand in:

1. Documentation as a pdf. No other format and not inside a zip file, so it opens directly in Canvas!
2. All code in one zip file. Please make sure to only put your own source code in the zip, using clear names for the folders and files. This means no executables, configuration files etc.

Good Luck!