ECE3623 Embedded System Design Laboratory

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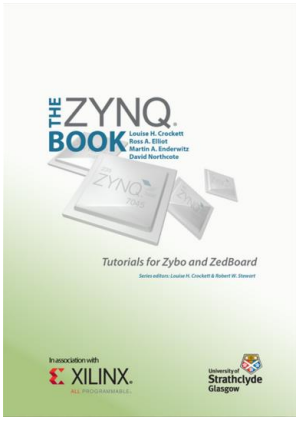
Vivado AXI Timer and Interrupts



In this Laboratory you will utilize the embedded development of a Vivado Zynq Processor System (PS) with the AXI Timer and interrupts. The tasks are described in detailed in Chapter 2 of the eText *The Zynq Book Tutorials* with the supporting files in the *The Zynq Book Tutorials Sources* both of which are posted on *Canvas* and the Lecture PowerPoints.

The Laboratory requires you to study and execute the fourth section of Chapter 2 of the *Next Steps in Zynq SoC Design*. Exercise 2D extends the previous projects in Chapter 2 of *The Zynq Book Tutorials* by adding the AXI Timer IP block as additional interrupt source and the *Concat* (concatenation) IP block to configure and complete the Zynq PS configuration.

The final section of Exercise 2D results in a task that increments a counter with interrupts from both the AXI Timer and the push buttons and displays the unsigned 4-bit binary count on the LEDs as a standalone process.

The Laboratory tasks are as follows:

1. Describe in detail the modules and complete operation of the unmodified *interrupt_controller_tut_2D.c* project. This will require that you research the various Xilinx Zynq C functions and parameters. Run the complete exercise without modification to verify its performance.

2. The LEDs are incremented on an AXI Timer interrupt as a 4-bit binary count with the addition of the BTN value as in Exercise 2D.\

3. You are to add a GPIO to interface the four slide switches (SW) to the project *without interrupts*. This will require you to locate the parameter description of this added GPIO. You should consider that an input GPIO could have two channels and this could be used here.

4. All push button interrupts (BTN0, BTN1, BTN2 and BTN3) are to be disabled if the slide switches are turned ON but only in this order (like a combination lock): SW3, SW1, SW2 and SW0. The combination lock sequence only starts again if all SWs are OFF.

   The LEDs are to display 1010 and 0101 and not the count alternatively with the default AXI Timer interrupt if the BTNs are disabled. If the BTNs are not disabled the LEDs continue to display the unsigned 4-bit binary count with the default AXI Timer interrupt.

5. All push button interrupts (BTN0, BTN1, BTN2 and BTN3) are to be enabled if the slide switches are turned OFF but only in this reverse order from the BTN interrupt disable (like a combination lock): SW0, SW2, SW1 and SW3. The combination lock sequence to enable BTN interrupts only starts again if all SWs are OFF then set ON as SW3, SW1, SW2 and SW0.

   If the BTNs are enabled the LEDs are to display the unsigned 4-bit binary count with the default AXI Timer interrupt.

Describe in detail and list the modifications to the *interrupt_controller_tut_2D.c* project file to accomplish each of these Laboratory tasks. You may be randomly asked to describe and demonstrate each of these tasks to the Laboratory Assistant at any point during the semester.

This Laboratory is for the week of February 10th and due no later than 11:59 PM February 16th with an upload to Canvas and a hard copy to the Laboratory Assistant soon afterwards.

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