

Homework Assignment 1

Using AXI GPIO, Interrupts, and AXI Timer

Task1:

Develop a HW/ SW codesign system that is capable of performing arithmetic operations, per the specification below.

Entire System:

The designed system should include the following components connected to achieve the desired functionality.

1. Processing system (PS) IP
2. PS Reset IP
3. AXI Interconnect IP (that includes 1 slave and 3 master interfaces)
4. AXI GPIO IPs (to connect to 4 LEDs, 1 Button, and 4 switches)

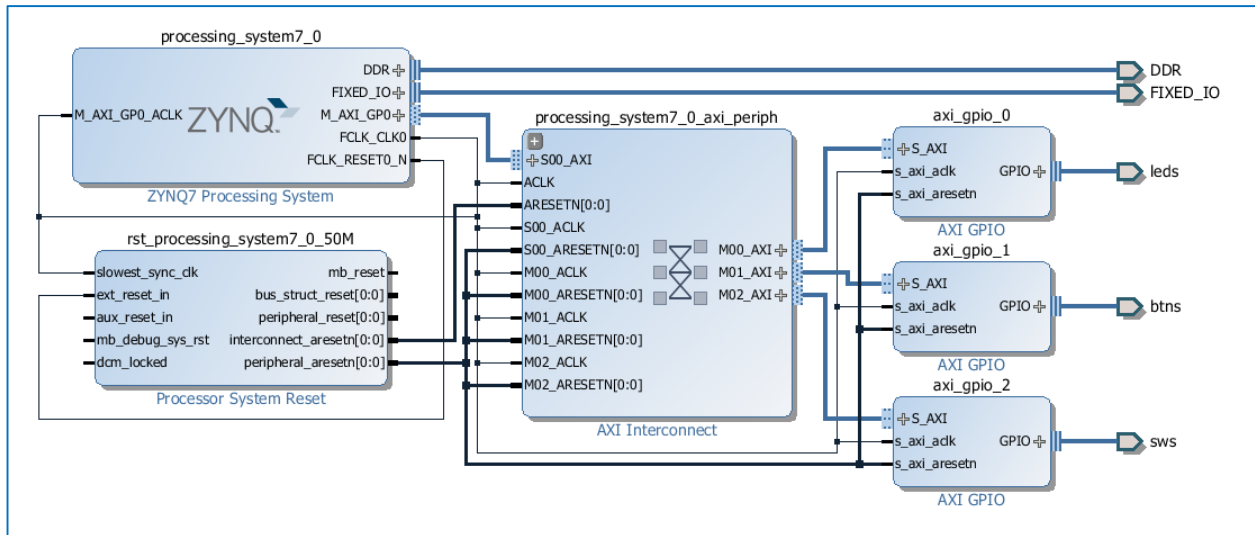
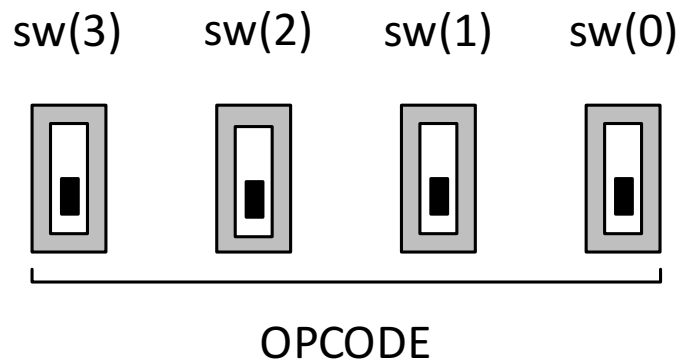


Fig. 1 Zynq PS interface with GPIOs.

In this design, each operation is initiated by a button press. R should be initialized to the value of the INIT constant defined in the C code (6 by default). C should be defined as a constant in the C file (5 by default).

OPCODE	OPERATION	MEANING	LED (MIO7)
0000	AND	$R = R \text{ AND } C$	-
0001	OR	$R = R \text{ OR } C$	-
0010	XOR	$R = R \text{ XOR } C$	-
0011	XNOR	$R = R \text{ XNOR } C$	-
0100	Addition MOD 16	$R = R + C$	-
0101	Subtraction MOD 16	$R = R - C$	-
0110	Multiplication MOD 16	$R = R * C$	-
0111	Division	$R = R / C$	-
1000	Rotation Right	$R = R \lll 1$	-
1001	Rotation Left	$R = R \lll 3$	-
1010	Logic Shift Right	$R = R \gg 1$	-
1100	Logic Shift Left	$R = R \ll 3$	-
1111	Check if R is prime	-	Blink 3 times

Switch configuration:



- Use two additional buttons (MIO50, MIO51), one to increment and the other to decrement the value of C.
- Blink the MIO LED (MIO7) once every time any of the buttons (MIO50, MIO51) is pressed.

Task2:

Develop a game that turns the onboard LEDs ON/ OFF in a specific way. You are only allowed to use interrupts on button presses and delays using hardware timer with interrupt.

Set the default interval between rotations to 1s.

BTN3: Start/stop button.

BTN2: Swap between the rotation right (default) and the rotation left.

BTN1: Increase interval between rotations by 1s (after reaching 5s, no further increase should be accepted).

BTN0: Decrease interval between rotations by 1s (after reaching 1s, no further decrease should be accepted).

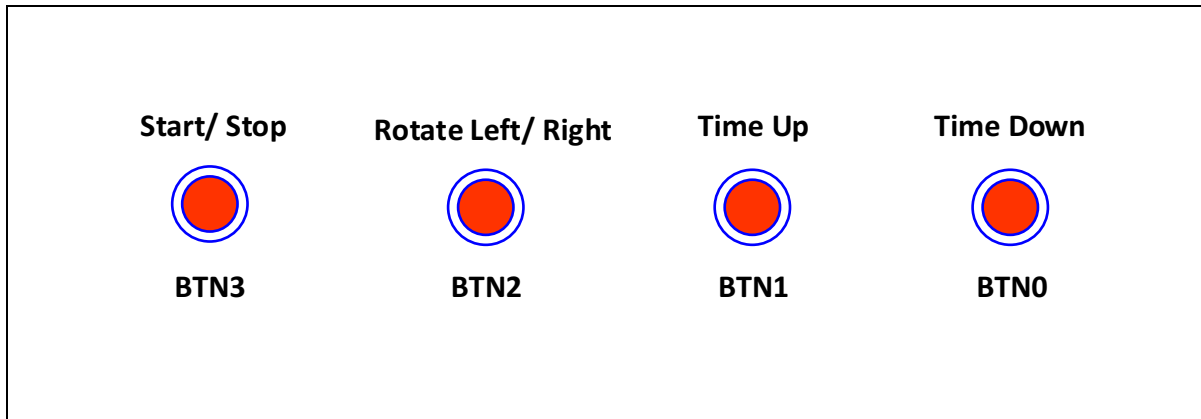


Fig. 1 Button functionality

Use LEDs to display the following patterns.

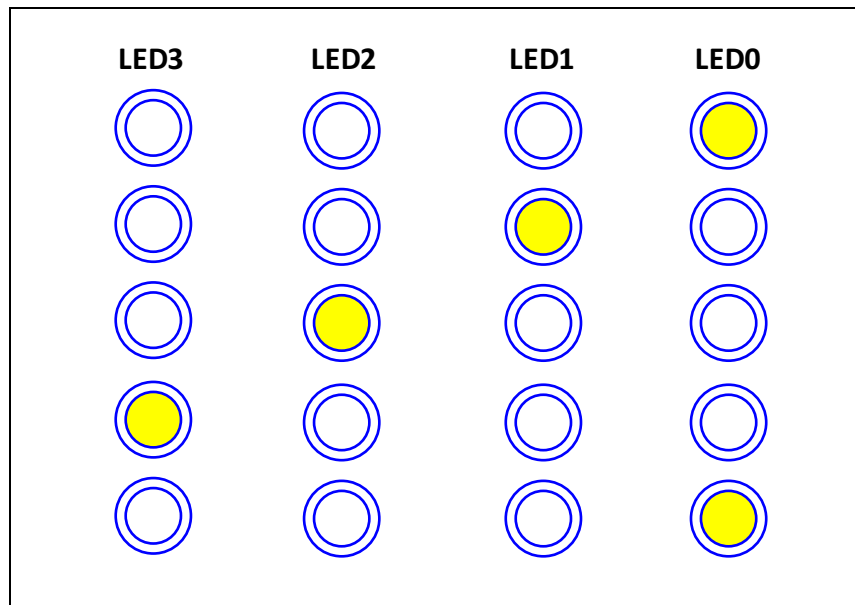


Fig. 2 Pattern: 1, Rotate left.

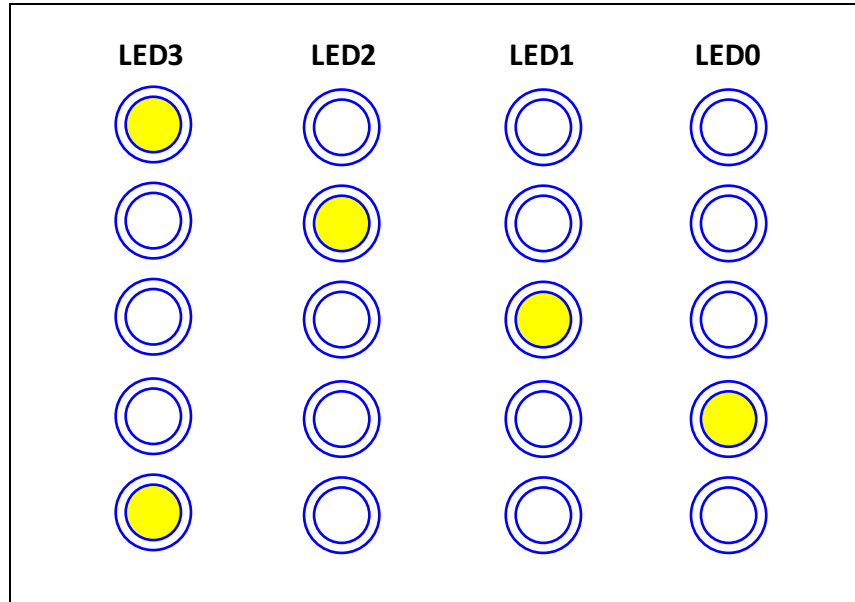


Fig. 3 Pattern: 1, Rotate right.

Deliverables:

Zip the project folder that includes all the software and hardware files necessary to regenerate the results for each of these tasks separately.

Deliverables Due	Wednesday, 02/24/2016, 6:00 PM
Demonstration Due	Wednesday, 02/24/2016, 6:00-8:00 PM Thursday, 02/25/2015, 10:00-11:00 PM