COEN 317 Lab 3 (UJ-X)

by

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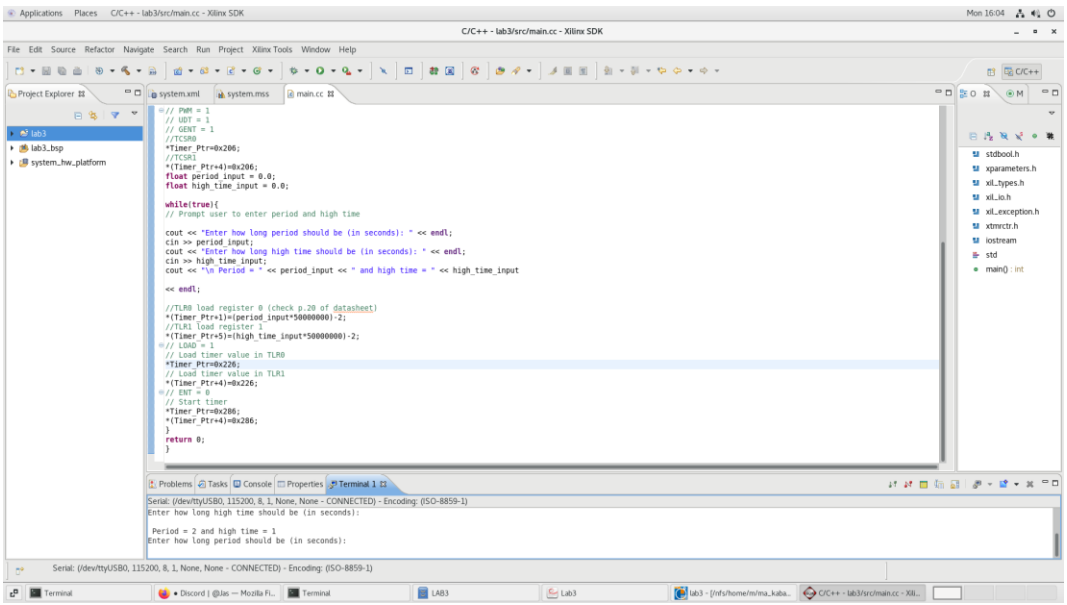
"I certify that this submission is my original work and meets the Faculty's Expectations of Originality."

Introduction

In this laboratory session, we explore the LogiCORE IP AXI Timer, a component featuring two built-in hardware counters. The lab exercises involve utilizing the timer across three distinct operational modes: as a basic timer/counter, in capture mode, and as a PWM (Pulse Width Modulation) device.

Results

In this part, we are asked to implement the PWM mode for the AXI Timer. Following the small changes mentioned in the lab, I made it to the SDK where I wrote the program for the main. To write the program, I referred to the pseudo code given in part 2 for the order of the process, the equations to calculate the period and the high time given in the lab manual, and the pseudo code given in part 3 for what the procedure should be. Additionally, I referred to the AXI Timer DS764 manual to find which bits I need to set and which registers to use. In the end, I managed to get the second light to dim thus, validating the code.



Conclusion

To sum up, the lab's goals were successfully achieved. Although I encountered some technical hurdles, such as the SDK's limitations on inputting values and IMPACT hindering the completion of the Capture mode, I was nonetheless able to gain a comprehensive understanding of the AXI Timer's operation, familiarizing myself with its registers and various control/status options.

APPENDIX

```
#include "stdbool.h"
#include "xparameters.h"
#include "xil_types.h"
#include "xgpio.h"
#include "xil_io.h"
#include "xil_exception.h"
#include "xtmrctr.h"
#include <iostream>
using namespace std;

int main()

{
        //modified from the code completed in the prelab

   static XGpio GPIOInstance_Ptr;
   u32* timerPtr = (u32*) XPAR_TMRCTR_0_BASEADDR; //creating a u32 variable that points to the address

   int xStatus;

   cout << "####  Counter Application Starts ####" << endl;


   //~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   //Step-1: AXI GPIO Initialization
   //~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

```
	xStatus = XGpio_Initialize(&GPIOInstance_Ptr, XPAR_AXI_GPIO_FOR_OUTPUT_DEVICE_ID);
	if(xStatus != XST_SUCCESS)
	{
		cout << "GPIO A Initialization FAILED" << endl;
		return 1;
	}

	//~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	//Step-2: AXI GPIO Set the Direction
	//~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	//XGpio_SetDataDirection(XGpio *InstancePtr, unsigned Channel, u32 DirectionMask);
	//we use only channel 1, and 0 is the the parameter for output

	XGpio_SetDataDirection(&GPIOInstance_Ptr, 1, 0);

	//~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	//Step-3: PMW Timer Initialization and Setting
	//~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

	*timerPtr = 0x206; //setting the control/status of reg0's PWM's timer to enable pulse width, enabling generate mode and, enable count down
	*(timerPtr + 4) = 0x206; //setting the second timeer's control/status

	 //~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	 //Step-4: Setting the Timer Option
	 //~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

	//the following are variables to control the timer
	float cycleTime; //variable for the duty cycle
	float periodTimer; //variable for the period

	cout << "Enter duty cycle time: " << endl; cin >> cycleTime;
	cout << "Enter period (s): " << endl; cin >> periodTimer;

	//----------perform the PWM-------------------------

	while(true){
       //50000000Hz  (given in lab)
	  *(timerPtr + 1) = (periodTimer * 50000000) -2;  // put results in loads
	   *(timerPtr + 5) = (periodTimer*(cycleTime/100)*50000000)-2; //putting percentage of duty in the timer 2's load
```

```
    //change controls to enable load the values from above into the timer
    *timerPtr = 0x226;
    *(timerPtr + 4) = 0x226;

    //change control to stop load and enable the counter
    *timerPtr = 0x286;
    *(timerPtr + 4) = 0x286;
    }
    return 0;
}
```