EE 474
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Lab 3 Report

Task 1a:

This task aims to familiarize students with the analog-to-digital converter (ADC) and the use of PLL to control the system clock frequency. We first followed the instructions in the comments of the given Lab3_Inits.c to initialize the on-board LEDs, and configure the ADC0 SS3 using the information provided by the datasheet. We also initialized Timer 0 at 1 Hz as a timer trigger for each sequence read by the ADC of the voltage sensor. Then we converted the measured voltage read from ADC to resistance and generated the desired LED lighting pattern as specified in the lab specifications. Lastly, we connected the circuit to test the functionality.

Task 1b:

This task is based on the previous task. It only added a new function to read the temperature and print it to the Terminal I/O. We first configured necessary registers on PLL to generate 12 and 120 MHz clock frequency. Then we initialized the timer as a timer trigger for the sequences read by ADC. We also initialized the port J pins for on-board switches. We initialized ADC which will operate through an interrupter to do temperature calculation, and printed the calculated temperature to the Terminal I/O.

Task 2a:

The second part of the lab aims to familiarize students with the use of UART for asynchronous serial communication, and the use of PuTTY. For 2a, we want to display the measured temperature as in Task 1b on PuTTY. We followed the instructions to configure UART0, set up PuTTY's connection, etc. and used a USB cable to connect the TIVA board and the computer. It is pretty much based on task 1b but now involving UART for data transmission.

Task 2b:

This task is based on task 2a. Instead of using a USB cable, we used bluetooth. We configured PLL and UART2, and connected the TIVA board to HC-06 for data transmission. We also need to set up HC-06 on the computer, note that the baud frequency for bluetooth is different from the default 9600.

Results:

Task 1a:

We don't know the exact resistance of the potentiometer, but we can see that when we increase the connected resistance (the measured voltage increases as well), more and more LED lights up, and vice versa. This pattern matches with what the specification has described.

Task 1b:

We observe that the temperature can be displayed on the terminal I/O, and using 12MHz (switch 1) has approximately 35-36 celsius degree temperature, while using 120MHz (switch 2) has approximately 37-38 celsius degree temperature, which is 1-2 degree higher than that of temperature using the lower frequency system clock as described by the specification.

Task 2a:

Same as 1b, we observe that the temperature can be displayed on the PuTTY terminal. Using 12MHz (switch 1) has approximately 31-32 celsius degree temperature, while using 120MHz (switch 2) has approximately 33-34 celsius degree temperature, which is 1-2 degree higher than that of temperature using the lower frequency system clock as described by the specification.

Task 2b:

When we type on the keyboard, the characters can be immediately displayed on the PuTTY terminal.

*** Since the circuit connection for this lab is pretty straightforward and simple, I am not posting it as figures here.

Conclusion:

ADC, PLL and UART are all important tools that can be used for more functionalities so this lab is a good introduction. The results, as demonstrated in the videos, match what we have expected (as described by lab specification). The lab took a lot of time not just because of the reading to learn about the configuration, etc. but also because it's kind of hard to debug. Sometimes it was the wrong configuration, sometimes it was the problem with the code whose location we cannot identify, sometimes it's the connection on the board or the setup on the computer. Overall, it was a good start and I believe that it will be very beneficial to the final lab.