Lab02 Measuring Event Time

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EE145M
Lab Time: 9-12pm Wednesday
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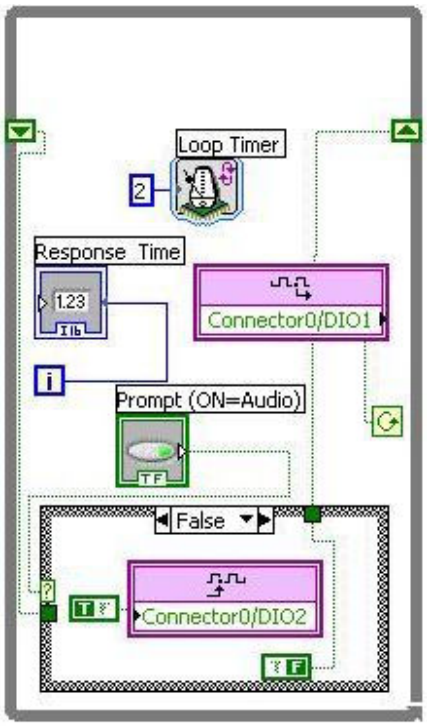
Questions

5.1

Briefly explain how the while loop in the 3rd pane of the block diagram produces an audible tone. What is the frequency of the tone? And what would the ramifications be if you simply tried to change the frequency without redesigning the block diagram?



Inside the while loop, there is a True/False case structure. When the condition is false, the output is zero, and when it is true, one. The response time is determined by the iteration number (i), and the output is tied to an indicator in the front panel. The zero's and one's generate the tone, and the period is controlled by the loop timer. The loop timer is on the scale of milliseconds, and the input is two in this case. Right now, the frequency is (1/2ms)=500Hz. If the number tied to the loop timer is changed, the period will be changed. The frequency (1/period) will be changed accordingly. For example, if the number is changed from 2 to 4, the response time is twice longer. An output of 100, which meant a period of 200ms will now mean a period of 400ms.

5.2

Suppose that you are convinced that a measured quantity really depends on some experimental variable, but after doing a preliminary experiment, you find that the Student's t value is too low to prove your case. What could you do to pursue the issue further?

Student $t = \frac{\bar{a} - \bar{b}}{\sqrt{\sigma_{\bar{a}}^2 + \sigma_{\bar{b}}^2}}$, so if the goal is to prove a measured quantity depends on some experimental variable, the student t should be large. At this moment, the problem is the student t is not large enough. There can be 2 possibilities, either (average(a)-average(b))

is small, or the root-mean-square of standard deviation is large. In other to pursue the issue, I would investigate the standard deviation. I would like to have a smaller standard deviation so student t would goes up, I would stop and improve the set-up before I do more runs for the experiment. Assuming (average(a)-average(b)) does not change, if the root-mean-square of standard deviation decreases after the improvement, student t would increase, then we can rule out the null hypothesis. That is to say the difference of data set a and data set b is not due chance, but some experimental variables.

5.3

What minimum intervals did you get in Part 6 of the lab? Would you expect the same results if a PC based acquisition system was used (such as the MIO-16E, or the old DT3010 board? Explain.

The minimal interval in part 6 is zero, which probably means the button was pressed before the signal is on. If the PC based acquisition system was used, such as the MIO-16E board, the minimal interval would be more than zero. That is because it takes time for the computer to latch data from the input button. Computer interrupts and software application can interfere with the data acquisition, and produces an inaccurate timing. On the other hand, FPGA operates on a fast and precise clock without the interruptions from software, which gives a more precise result.