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ME235 S2020

Final Project Report

I have played the guitar since I was in elementary school. After acquiring different tools to help with learning and playing the guitar, I found that the guitar tuner was by far the most useful. Unfortunately, I lost my guitar tuner a few years ago and have not purchased a new one since. Because of my frugalness, I have relied on searching on Youtube for videos of the sound of properly tuned guitar strings and matched the frequency in order to tune my guitar. My goal for this project is to simulate and eventually create a guitar tuner using the PSoC 5LP and LabVIEW to replace my current, inefficient method of tuning.

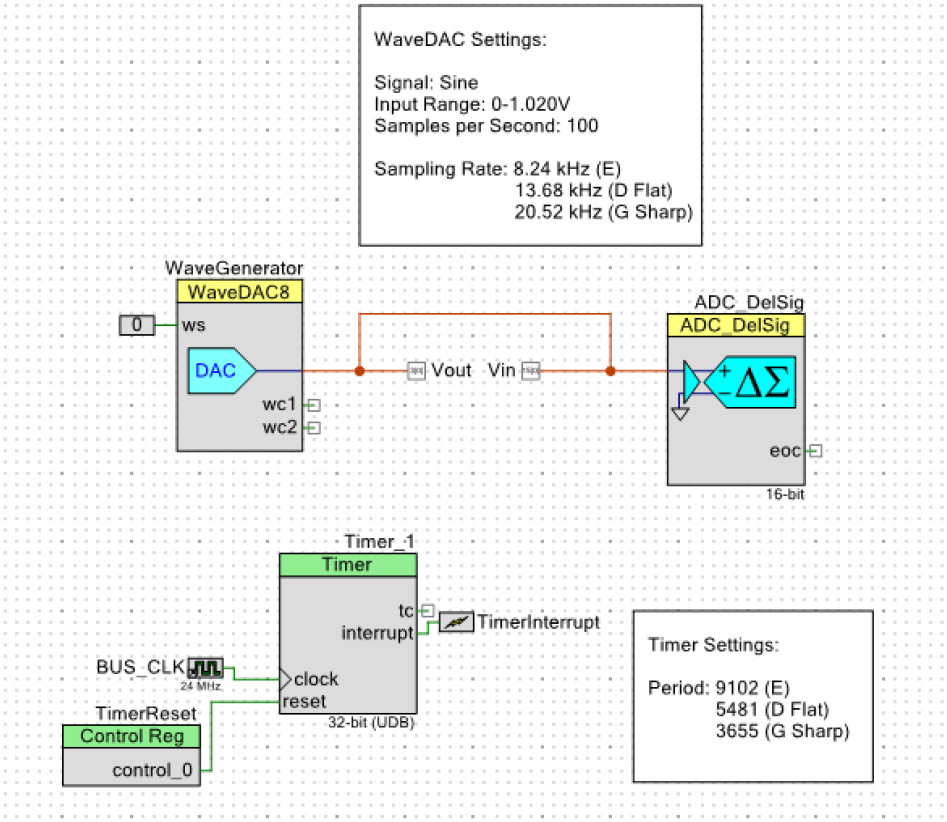
Prior to the proposal, I found the most difficult challenge was finding hardware for the project. Initially, I looked through multiple websites for microphones. However due to COVID-19, the parts from every website would arrive after the deadline for the project. I was forced to fully simulate my guitar tuner by using the Wavedac-8 to create soundwaves of different string frequencies, sacrificing some complexity of the project as I only had to deal with fundamental frequencies. Because of this, my goal changed to fully simulating the guitar tuner and buy hardware in the future when deliveries for nonessential items are faster.

I faced several technical challenges throughout this project. I initially did not know how to properly transfer data from the PSoC to LabVIEW. I was able to overcome this by completing Lab 7 and truly understanding the ping pong buffer as well as casting and transferring the correct data type and order of bytes between PsoC and LabVIEW. This was shown in my C code in PSoC Creator. Another challenge I faced was measuring frequency. Many common methods of measuring frequency in LabVIEW are designed for analysis on large amounts of dynamic data. My project does rely on dynamic data but instead on packages of data, forcing me to dive deeper into understanding how LabVIEW

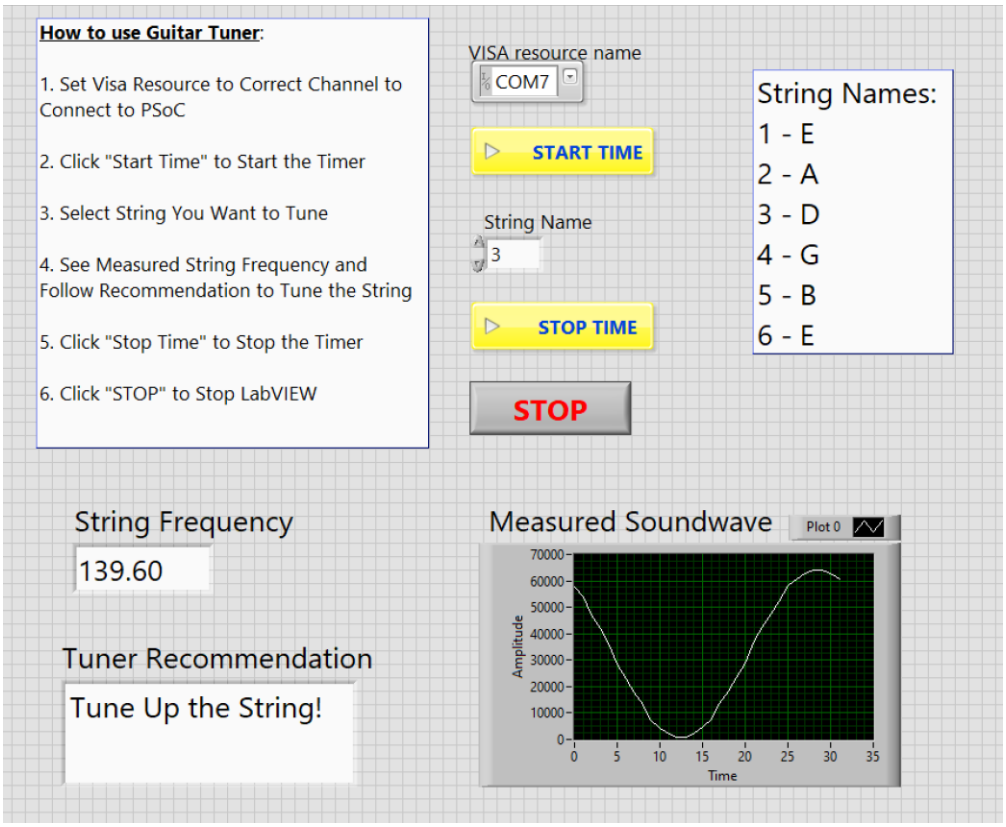
measures frequency. My solution was to utilize a frequency measuring SubVI using the given specific timer period for the soundwave I am measuring. The timer period was added to the package I send through PSoC and was necessary to accurately measure the frequency of the soundwave. Finally, I faced the challenge of finding the correct timing to send and receive data. This was also heavily influenced by Lab 7 as I was able to understand the transfer rate between PsoC and LabVIEW was crucial for the expected data to be accurately transferred between the two. This was done by setting the timer interrupt to the period of the soundwave divided by the number of elements in the ping pong buffer array, ensuring that both the ping and pong buffer will send the complete and same portion of the soundwave every time.

If I were to restart this project, I would change several things. From the beginning, I would have spent more time brainstorming and thinking of the project much sooner. Although it was understandable it takes an ample amount of time to think of an idea that meets the new constraints due to COVID-19, I would have planned more in the early stages so I could have acquired hardware prior to the project deadline. I would also change my time management of the project. I had put in a lot of time completing the project the week which was primarily due to time mismanagement and juggling my MEng capstone presentation and finals the same week. Although I completed the project with an sufficient amount of time remaining, it would have been nice to not have to deal with the extra stress.

Images:



PSoC Top Design



LabVIEW GUI Measuring DFlat