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ECE 342

Project Summary

An oscilloscope is an incredibly useful and versatile tool that is used for all kinds of electrical projects. However, oscilloscopes can be very expensive. When it comes to smaller projects where you are measuring smaller voltages and currents, a high-quality oscilloscope may be unnecessary. For my project I created an oscilloscope from a microcontroller. Microcontrollers can be far less expensive than a high-quality oscilloscope and will get the job done on smaller projects.

My goal for this project was to create a two-channel oscilloscope out of a microcontroller. The first step was to do some research and decide what kind of microcontroller I would use. I decided to use the Arduino Uno that was included with the ECE 341 class materials. Once I had this figured out, I needed to make a block diagram with interface definitions.

With the block diagram and interface definitions I was ready to work on the processing block. This was meant to take an analog voltage input and output a set of voltages. The main challenge here was figuring out how I could send large samples of voltage values without exceeding the maximum memory on the Arduino. Limits to the signals that I could read were mainly due to limits on the Arduino. Later, I made and ordered a PCB that would allow me to connect oscilloscope probes to my Arduino.

The next part I needed to tackle was the display block. This would take data from the Arduino that was sent through the serial port and display it. The GUI would need to include a user-friendly interface that would allow the user to adjust sensitivities, select channels, and start and stop the program. One of the main challenges with this part was finding the best way to quickly and efficiently read the data from the Arduino.

Finally, I needed to merge these two parts together. Luckily, this wasn't too challenging since I had set up both parts fairly well and they were ready to be put together.

One of the lessons I learned from this project is the importance of planning and organization. This is one of the bigger projects that I've worked on and having the timeline, block checkoffs, and other assignments helped me stay on task and complete the project on time. On the technical side of things, I learned quite a bit about MATLAB. I have not used MATLAB much until now and it has proved a very valuable tool. Specifically, I really enjoyed using the app creator. It made creating my GUI straight forward and easy to understand.

Below is the timeline I used for my project. This is the draft that I created earlier in the term. Unfortunately, when I tried updating the timeline on Microsoft Project, I encountered an issue with Citrix that I have yet to resolve.