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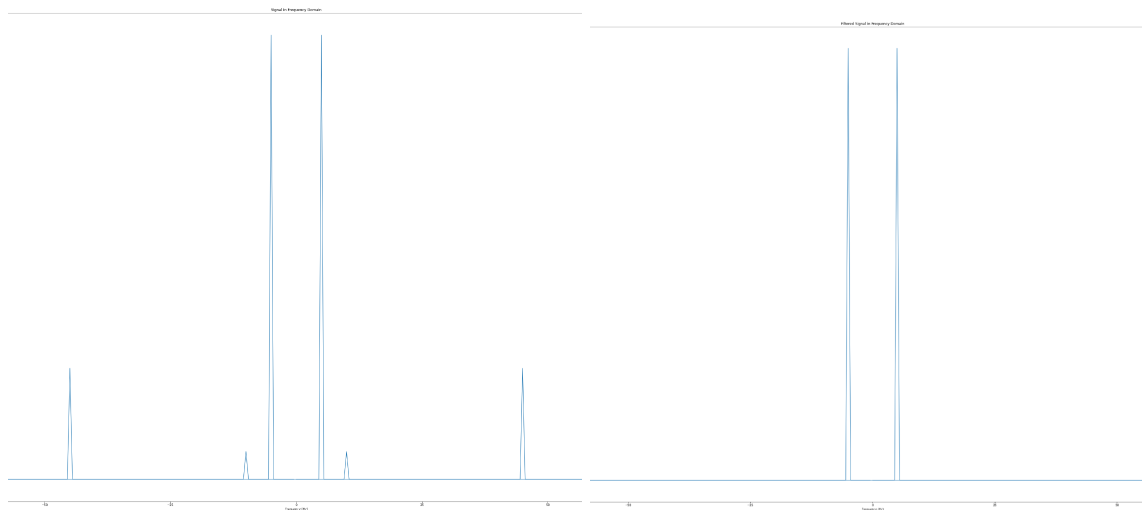
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EE 104 Lab 3 READ ME file.

To successfully run this Lab, ensure Spyder and LTspice are preinstalled. Portions 2-4 will require Spyder while portion 5 will require LTspice. A local version of Jupyter Notebook from Anaconda will do for portion 1, however, the last portion, 6, requires Jupyter Notebook to be accessed through a PYNQ-Z2 board with the 2.6v image flashed on a micro sd card. For further detail and to learn how to manipulate any of these files please reference Lab 3 Documentation.

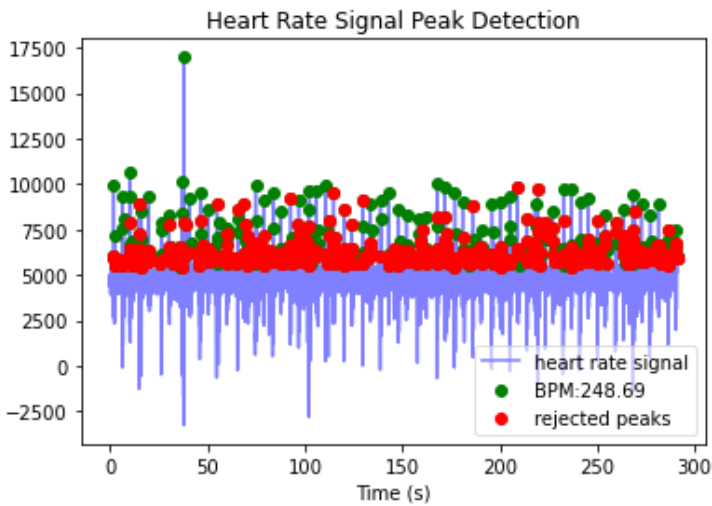
Audio Signal Processing (1)

A waveform with 3 tones and different frequencies is made and used to run through a noise cancellation application. The code shows the signals in the frequency domain and filters out one frequency. The data is then plotted in the frequency domain to compare the difference between before and after.



Heart Rate Analysis (2)

Using a waveform from the heartbeat soundbank, the WAV file is inspected in a CSV file. The heart rate signal is plotted in the time domain. The signal is then measured at a sample rate of 300. The heartpy measurements are output and inspected to find the beats per minute.



```
bpm: 248.689852
ibi: 241.264368
sdnn: 121.086758
sdsd: 105.711051
rmssd: 197.716126
pnn20: 0.937500
pnn50: 0.812500
hr_mad: 100.000000
sd1: 130.862192
sd2: 109.917504
s: 45188.811491
sd1/sd2: 1.190549
breathingrate: 0.214669
```

Red Alert (3)

Using a base code given in class for the Red Alert game, alterations are done to leverage the game in three different ways, A need for speed, Try again, and Shuffling. In A need for speed, the stars are designed to fall at different speeds making it harder for the user to look at all the stars at once. In Try again, the user now can press the space key to play again after they failed or completed the game. The final alteration Shuffling changes the position of the stars every half second testing the user's reaction time.

