lab9_blastiocardiograph

December 7, 2019

1 Lab 9: Blastiocardiograph

In this lab, a bathroom scale was used to measure my heart rate by using an electrical circuit called a blastiocardiograph. This works because when the heart beats, the heart pumps blood upwards, creating a small normal force that can be measured by the scale. The blastiocardiograph filters out the low frequency noise from the body weight and the high frequency electrical noise from the power supply, then amplifies the signal enough to be read.

```
[2]: import pandas as pd
     %matplotlib inline
```

1.1 Hardware Setup

There are 3 stages to this circuit. The first stage is an instrumentation amplifier using an AD623. The next stage is a second-order active band pass filter with cutoff frequencies 0.5Hz and 16Hz and gains of 33, with a total gain of 1089. The last stage is a sallen-key second-order low pass filter with a cutoff frequency of 3.2Hz and gain of 4.

One thing that had to be changed on the circuit was to not ground the amplifiers to the power supply. To do this, the power supply was flipped so one side of the rails was floating relative to the power supply, then grounded to the analog discovery.

1.2 Bode Plot

```
[8]: bode = pd.read_csv('data/bode-1.csv')
     bode.plot(x='Frequency (Hz)', y='Channel 1 Magnitude (dB)')
```

```
[8]: <matplotlib.axes._subplots.AxesSubplot at 0x7f0cbaed9b10>
```

1.3 BKG Trace

```
[9]: bkg_trace = pd.read_csv('data/bkg.csv')
     bkg_trace.plot(x='Time (s)', y='Channel 1 (V)')
```

```
[9]: <matplotlib.axes._subplots.AxesSubplot at 0x7f0cbae48250>
```