

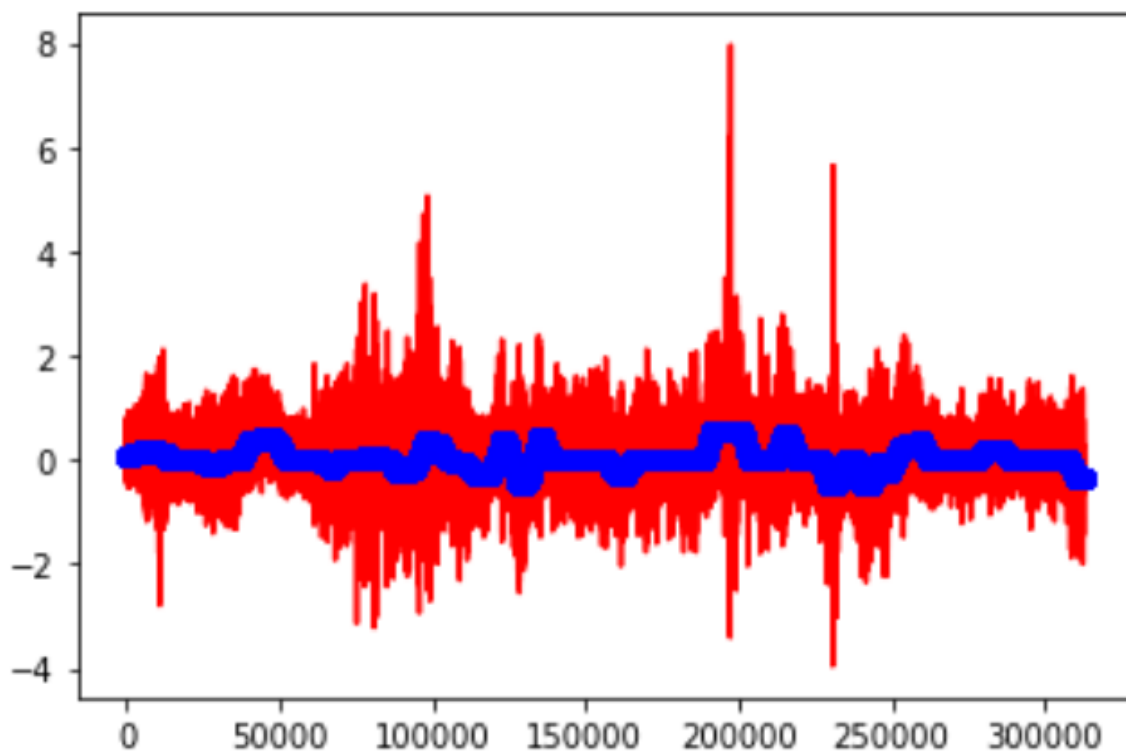
Problem 1 - Load data

Load the attached data from the .csv file into a NumPy array. Plot both measured and simulated acceleration data on top of each other. Also, plot the difference $a_{sim} - a_{meas}$. Discuss in your report any similarity between the two data columns.

Answer:

I have used NumPy to load the .csv file and plotted both measured and simulated data on top of each other. In addition to that, I have also plotted the difference between these two accelerations. The graphs are given below:

1. Simulated acceleration vs measured acceleration

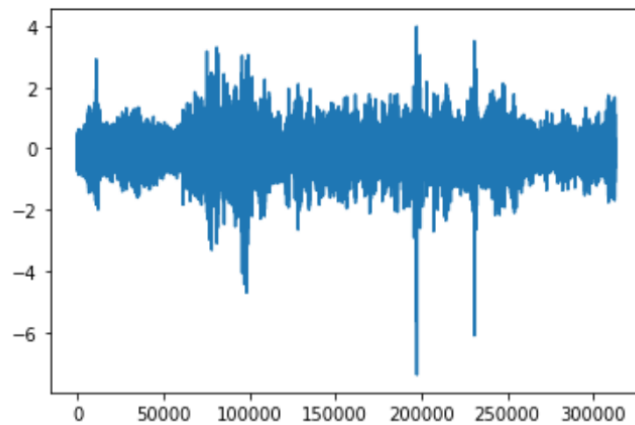


The above diagram shows the plot between Simulated acceleration and measured acceleration. The red plot in the above graph indicates measured acceleration whereas the blue one shows the plot for the simulated acceleration. As we can see the graphs of both measured and simulated acceleration are similar in structure but the only difference is measured acceleration graph is more amplified than simulated acceleration.

2. Difference between simulated acceleration and simulated acceleration.

```
In [5]: plt.plot(simulated-measured)
```

```
Out[5]: [<matplotlib.lines.Line2D at 0x7f5daba23f10>]
```

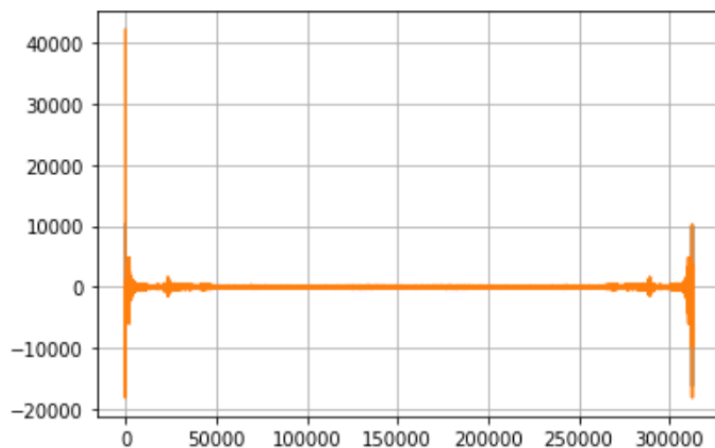


Problem 2 - FFT

Run FFT on the acceleration data. What do the resulting frequency spectra tell you? Can you, based on the source of the data (moving train), give a physical explanation of the results?

Answer:

I have executed FFT on both acceleration data and got the following graphs in the plot. The diagram is given below:



Problem 3 - Compare model with measurement

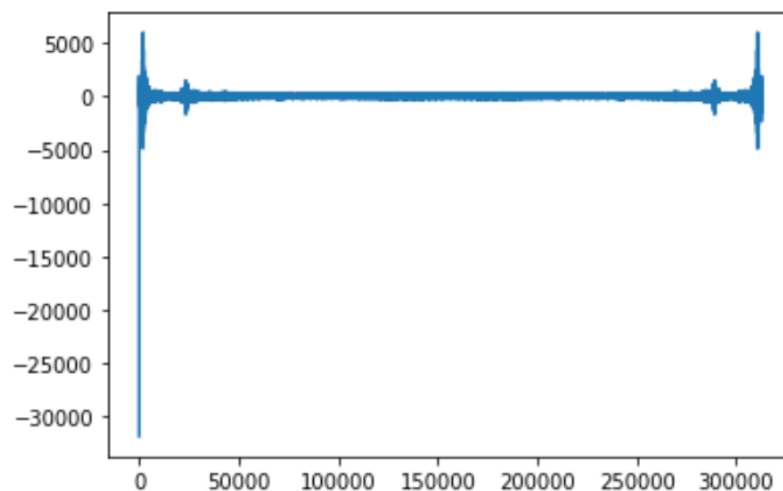
Subtract simulated data from measured data. Run FFT again on the difference between measured and simulated data. Compare the resulting spectra to that in task 1. Is there any difference? If so, explain the difference in information content.

Answer:

I have calculated the difference between simulated acceleration and measured acceleration ($A_{\text{simulated}} - A_{\text{measured}}$) in task one and FFT on that difference value here. The plotted graphs of both diff and FFT of difference of simulated and measured acceleration is given below:

1. Plot for FFT on the difference between simulated acceleration and measured acceleration

Out[13]: [`<matplotlib.lines.Line2D at 0x7f5dab931b50>`]



2. Plot for the difference between simulated acceleration and measured acceleration

In [5]: `plt.plot(simulated-measured)`

Out[5]: [`<matplotlib.lines.Line2D at 0x7f5daba23f10>`]

