Labjournal Fourier Analysis

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2023-04-29

**What I did**

I have to admit that I haven’t been able to do much, because of king’s day.

However, I did make a github so I can upload and update this lab journal and my code.

I also started writing a simple code that creates a data set of a sinusoidal function and also plots the FFT of and the original function using the inverse FFT, like gerhard asked me to. I used some internet for this: <https://pythonnumericalmethods.berkeley.edu/notebooks/chapter24.04-FFT-in-Python.html>.

At first I couldn’t get the IFFT graph to work, but soon found that the problem was me; I immediately put the FFT values in abs().

**Comments:**

* I noticed that the FFT graph is symmetric around the middle point: i.e If I spot a maximum at the first position, another maximum with the same amplitude will be at the last position. I expected it to be symmetric around the x=0 axis.
* I noticed that the timestep between two points of the sinusoidal dataset is equal to total Interval / ( amount of data points in between).

And the frequency step between two data points in the FFT graph is equal to 1 over this.

2023-05-01

Meeting with Gerhard

Had my first meeting With Gerhard Blab, he gave me some code he wrote in MATLAB and explained to me what he expected of me.

He’s expecting me to write a python version of his code and improve it.

He’s also expecting me to find out when which type of fit works best under which circumstances and if the amount of data points impact the fit (they do).

Gerhard was also kind enough to give me access to the Ornstein Lab and to a computer in the building as my main laptop is broken right now.

We also agreed on meeting once every monday.

2023-05-07

Finally managed to find some time to start ‘translating’ Gerhard’s code from Matlab into Python.

I had a lot of issues figuring out how the FFT\_peakFit function worked, but managed to figure it out. The barycentric and quadric methods were easy to implement, sadly the other two kept giving me figures that didn’t match Gerhard’s.

Sadly, due to the being busy with elections and the department’s day of physics I haven’t been able to do much more, so I decided to mail Gerhard to postpone our meeting till friday after the elections and Department’s day

2023-05-11

Finally managed to make the plot comparing code parts work. Figured out what I did wrong with the other two methods. The method’s described on <https://dspguru.com/dsp/howtos/how-to-interpolate-fft-peak/> that Gerhard sent me work better than those I previously found on google with the same name.

Also Made a start with the second half about noise analysis, but ran into a problem where Gerhard tries to add an array of 1000 by 700 to a list of 699 elements in line 92. I’ll ask him on friday about what he was trying.

I also did some literature research and tried to find out about how to quantify if a peakfit is relatively good or bad. <https://www.researchgate.net/publication/284178826_Good_Practices_for_XPS_and_other_Types_of_Peak_Fitting_Use_Chi_Squared_Use_the_Abbe_Criterion_Show_the_Sum_of_Fit_Components_Show_the_Normalized_Residuals_Choose_an_Appropriate_Background_Estimate_Fit>