Home Assignment 1

This assignment consists of two parts. The second part is slightly more difficult as it requires fitting a function to the power spectrum. It is enough to complete a single part to complete the whole assignment but students who will have compelted both parts, can skip one of the future assignments of their choice.

In either part, using an FFT package of your choice, find the power spectrum of the time series provided in a file and plot it on a log-log scale. Set the actual sampling time as the time unit so that the Nyquist frequency is $1/2$. Construct the Wiener filter, apply it to the data and plot the filtered signal. You may try using various window functions.

There are 4096 points in each of the data files. Try doing the same using the first 2048 or 1024 data points only.

Part 1. The data for this part are provided in the file `http://th-www.if.uj.edu.pl/zfs/gora/timeseries18/assgn1a.txt`. The noise spectrum is supposed to be flat. Use the high-frequency part of the noise to get a *rough* estimate of the noise background.

Part 2. The data for this part are provided in the file `http://th-www.if.uj.edu.pl/zfs/gora/timeseries18/assgn1b.txt`. The noise background is supposed to have the power spectrum

$$N(f) = \frac{\alpha^2}{1 + \beta^2 - 2\beta \cos\left(2\pi \frac{f}{\tilde{f}}\right)}$$

where $\tilde{f}$ sets the scale so that Nyquist frequency equals $\frac{1}{2}$. α^2 and β are the parameters that actually need to be fitted. The fit may be quite rough, do not waste too much time on fine-tuning these parameters.

I need to see the plots and I need to know what software packages, programming language and window functions you have used. I do not need to see the actual code.

Have fun,
PFG