

Exercise FIR filter in PPG application

Please download the sampled PPG signal $x(n)$ ppg_train8.xlsx. This dataset is attached to publication 'Real-world PPG dataset'. <https://data.mendeley.com/datasets/yynb8t9x3d/1>

Each PPG signal contains 300 samples (6 seconds recording) with 50 sample/second sampling rate.

Please analyze the signal as follows using MATLAB:

- Plot the signal $x(n)$ and add high frequency Gaussian noises

Hint:

% Generate and add high-frequency noise

noise_amplitude = 200; % Amplitude of the high-frequency noise

high_freq_noise = noise_amplitude * rand(length(x),1);

x_noisy = x + high_freq_noise;

- Perform a discrete frequency analysis on the signal and determine the amplitudes and frequencies of the signal.
- Remove high frequencies that are assumed to be noise (by setting high frequency components to 0). You can try cutoff frequency 5Hz.
- Perform an inverse Fourier Transform to reconstruct $\tilde{x}(n)$.

----- above are the old tasks that you can find from the previous exercise -----

- Design a FIR filter with Hamming window, cutoff frequency 5Hz, please try different filter order.
- Implement the FIR filter with the above noisy PPG signal. You can use function 'filter()'.
• Compare the output of FIR filter and the above filtered signal.