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clear;
close all;
clc;

[inputSignal, fs] = audioread('noisysignal.wav');
% [noise, fs] = audioread('noise.wav');
% [signal, fs] = audioread('signal.wav');

filterOrder = 50;
cutoffFreq = 1000;
normalizedCutoff = cutoffFreq / (fs/2);

% Hamming window
window = hamming(filterOrder+1);
b_hamming = fir1(filterOrder, normalizedCutoff, window);

filteredSignalHamming = filter(b_hamming, 1, inputSignal);

H = snr(inputSignal-filteredSignalHamming,filteredSignalHamming);
disp(['SNR of FIR Hamming filtered Signal: ', num2str(H), 'dB']);

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SNR of FIR Hamming filtered Signal: 7.1147dB

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% Blackmann window
window = blackman(filterOrder + 1);
b_blackmann = fir1(filterOrder, normalizedCutoff, window);

filteredSignalBlackmann = filter(b_blackmann, 1, inputSignal);

B = snr(inputSignal-filteredSignalBlackmann,filteredSignalBlackmann);
disp(['SNR of FIR Blackmann filtered Signal: ', num2str(B), 'dB']);

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SNR of FIR Blackmann filtered Signal: 6.916dB

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% Butterworth Filter
order=1;
[b_butterworth, a_butterworth] = butter(order, normalizedCutoff);

filteredSignalButterworth = filter(b_butterworth, a_butterworth,
inputSignal);

B = snr(inputSignal-filteredSignalButterworth,filteredSignalButterworth);
disp(['SNR of IIR Butterworth filtered Signal: ', num2str(B), 'dB']);

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SNR of IIR Butterworth filtered Signal: 3.6875dB

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% Chebyshev Type IIR Filter
order=1;
ripple = 1;

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RippleStop = 20;
[b_chebyshev2, a_chebyshev2] = cheby2(order, RippleStop, normalizedCutoff,
'low');

filteredSignalChebyshev2 = filter(b_chebyshev2, a_chebyshev2, inputSignal);

C2 = snr(inputSignal-filteredSignalChebyshev2,filteredSignalChebyshev2);
disp(['SNR of IIR Chebyshev1 filtered Signal: ', num2str(C2), 'dB']);

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SNR of IIR Chebyshev1 filtered Signal: 18.4218dB

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% Elliptic Filter
order=1;
ripplePass = 1;
rippleStop = 40;
[b_ellip, a_ellip] = ellip(order, ripplePass, rippleStop, normalizedCutoff);

filteredSignalElliptic = filter(b_ellip, a_ellip, inputSignal);

E = snr(inputSignal-filteredSignalElliptic,filteredSignalElliptic);
disp(['SNR of IIR Elliptic filtered Signal: ', num2str(E), 'dB']);

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SNR of IIR Elliptic filtered Signal: 2.1327dB

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% Bessel Filter
order=1;
[b_bessel, a_bessel] = besself(order, normalizedCutoff);

filteredSignalBessel = filter(b_bessel, a_bessel, inputSignal);

Be = snr(inputSignal-filteredSignalBessel,filteredSignalBessel);
disp(['SNR of IIR Bessel filtered Signal: ', num2str(Be), 'dB']);

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SNR of IIR Bessel filtered Signal: 26.8682dB