Complex Engineering Assignment

De-noising of Speech Signal Using Digital Filters

Problem Statement: With the increased use of communication via digital signal speech data in real world applications, noise reduction in the data is becoming significantly important. Background noises in speech data are coming from different sources including traffic, crowd and uncontrollable environmental parameters. The purpose of this assignment is to design and explore digital filters (both FIR and IIR) in order to reduce noise in the speech signal.

Consider the audio signal named **"Audio_signal_with_noise.wav".** The signal has been contaminated with noise. Design a filter of your own that will sufficiently remove the noise so as to allow the underlying audio signal to be heard with good quality. Please provide the followings:

1) Play the audio and show the magnitude plot of audio signal.
2) Find out the periodicity of the audio signal (if any).
3) Design at least four filters. For each of the designs, plot the magnitude response (in dB), phase and the pole-zero diagram.
4) Filter noisy signal using your de-noising filter. Listen to the filtered and original files.
5) Finally, comment on your best filter and specifically comment on the following: How does the quality compare for each filter design? What aspects of each filter do you think contribute to this?