EC3400 Computer Assignment 6

In this project we apply the technique of *Decimation* and *Interpolation* in order to resample a discrete time data sequence.

Problem : you want to mix two audio files into one file, so you can play them in your computer. The two given files are *JH.wav* and *opera.wav* as given: the first is sampled at 8,000 samples per second, and the other is sampled at 44,100 (round it to 44,000) samples per second. You want to resample both at 12,000 samples per second

Q1: Resample each file to 12,000 samples per second. For the low pass filter, use a linear phase equiripple filter with at least 50 dB attenuation in the stopband.

Q2: Compare the frequency spectra of the two sequences in terms of analog frequency, to make sure that they represent the same signal. Make sure that you subtract the mean before taking the fft. Also listen to the result (you may use the *sound* command in matlab) to see if it is what you expect.

Problem 2: Implement the each one of the two resampling operations in Problem 1, using polyphase filters. In particular all filters have to be implemented at the lowest sampling frequency. Compare the result with Problem 1, and make sure the outcome is the same.

Note on Matlab.

To upsample and downsample a signal x by a factor N use the matlab functions:

y=upsample(x,N)
y=downsample(x,N)