HOMEWORK 1: Quantization of the coefficients of FIR filters

In the lecture notes we considered a very simple technique for quantizing the coefficients of linear-phase FIR filters. Check whether the results are similar for the case where the passband and stopband edges are located at $\omega_p = 0.2\pi$ and $\omega_s = 0.25\pi$. The ripple values are the same as in our example case. Utilize the programs /home/ts/matlab/dsp/firgen.m and /home/ts/matlab/sldsp/firquan.m.

HOMEWORK 2: Quantization of the coefficients of IIR filters

It is desired to implement a sixth-order IIR filter using three second-order direct-form II blocks. The passband and stopband edges are at 0.1π and 0.15π, respectively. The required passband and stopband ripples are 0.5 dB and 60 dB, respectively. Design the filter using the L_∞-scaling. The main goal is to design this filter such that the number of fractional bits for the coefficient representations is as low as possible. Use the Matlab-files ordel.m and iircoe.m in the directory /home/ts/matlab/sldsp.

HOMEWORK 3: Design of FIR filters as a tapped cascaded interconnection of identical subfilters

Consider page 42 of the pile entitled "DESIGN OF FIR FILTERS USING INDENTICAL SUBFILTERS AS BASIC BUILDING BLOCKS". Check whether the data for $N = 20$ is correct in the table. Consider both Cases A and B. Some hints. First use extralin.m with "0 for automatic optimization". It is good to give a command "close all; clear all" in the very beginning. For Cases A and B, give 1 and 2, respectively, to save the data to a file called linfir. Give 'format long' and find the values of xxs1, xxs2, xxp1, and xxp2. Note that instead xs1, xs2, xp1, and xp2, xxs1, xxs2, xxp1, and xxp2 are given. The desired values for the subfilter in the passband and stopband are then des1=(xxp1+xxp2)/2 and des2=(xxs1+xxs2)/2. The permissable deviations are dev1=xxp2-(xxp1+xxp2)/2 and dev2=xxs2-(xxs1+xxs2)/2. Put these into memory. Use then "close all" and firgen.m for finding the minimum subfilter order. Note that for Case A the estimated initial order is not correct since the filter under consideration is not a normal filter. Note also that the order should be even. In our case, it is, furtunately, even. The next step is to give commands "hh=rot90(hs)" and "save hsub hh -ascii -double". Finally, use subfir.m. Good luck! Due to the fact that the Remez routine is using too few grid points there are some problems in the resulting overall filter. What are the problems? These problems can be get around by using more grid points in the Remez routine. Note that the people prepared the MATLAB TOOLBOXES are not experts at all!!