TD Machine: Design of filter-banks

Objective: Design a tree-structure 8-channel filter bank.

A-/ **Design the PR Orthogonal 2-ch filter bank**

Design the analysis/synthesis two-channel orthogonal filter bank using the MATLAB function firpr2chfb. The filter length is N=32, and the lowpass passband edge frequency ωp=0.43π. Plot the impulse responses of the analysis and synthesis filters: h0[n], h1[n], g0[n] and g1[n]. Compute and plot the poles and zeros of the transfer functions H0(z), H1(z), G0(z) and G1(z). Compute and plot the magnitude and group delay responses of the analysis filters H0(z) and H1(z). Compute and plot the impulse response of the distortion transfer function t[n].

B-/ **use this filter bank to compose the 8-ch filter bank**

Compose the eight-channel tree-structured analysis/synthesis filter bank. As a basic building block use the orthogonal two-channel filter bank and construct the analysis and synthesis banks. Compute and plot the magnitude responses of the resulting eight analysis filters. Verify the magnitude-preserving property of the overall bank.

C-/ **Use this filter bank to decompose a rectangle signal**

1 square of 200 samples of 1 over 1000 of 0 by example.
Plot all the channel time response, and check the SBC impulse response.