SF2702 Wavelets

# Homework nr 2

Handed out September 20, 2009
To be handed in October 15, 2007

**Computations with the Haar filter using Matlab:**

Given input signal $A$ with 128 samples:
*A(1:83)=(1:83);*
*A(84:128)=40*ones(1,128-83);*
*plot(A);*

1. Compute all lowpass and highpass coefficients in the wavelet filter tree of $A$ using the Haar filter in 8 levels. Plot the highpass and the lowpass coefficients at each level..
2. What is the mean value of the signal $A$
3. How many wavelet coefficidents have absolut value greater than $0, 1, 2, 5$ resp.10?
4. Do an exact reconstruction of the signal from the wavelet coefficients.
5. Do approximative reconstructions $A_K$ of the signal $A$ with all wavelet coefficients which are greater than $K$, where $K = 1, 2, 5$ resp 10. Plot the signalers $A, A_1, A_2, A_5$ and $A_{10}$ each on single plot and also all together in a joint plott.
6. Norm esitmates: Verify that the square sum of the signal $A$ and the square sum of the wavelet cefficients are the identical.
7. Error estimates: Compute the square sum of the error $A - A_K$ for the approximative reconstruction when $K = 1, 2, 5$ resp. 10. How large is signal to noise rate (in decibel)

$$SNR = -20 \quad {}^{10}\log \frac{||A - A_k||}{||f||}$$

**Comput the coefficient of the wavelet filter of length 4 using local rotations**
(The higpass filter has to have vanishing 0-th och 1-st moments .)
Give the answer in exact form (with square-roots)

**Computations with wavelet filters of length 4 in Matlab**

Do the corresponding exercises with this filter as was described above for the Haar filter Observe:The signal $A$ is thougth to be defined for all integers, and that it has value 0 outside the interval [1:128]. Because of that at each level the wavelet filter is generating more coefficients than those coefficients we we considered in the case above whith the Haar filter.