Course description

Name of course: Wavelets and filter banks - image processing

Credits: 4

Hours/week: 2+2

Type: lecture+practice

Topics:

1. Introduction – Fourier Transform and Wavelet Transform – short overview

2. Haar wavelet

3. Lowpass filter -Highpass filter

4. Filter Bank (FB); The Analysis and the Synthesis Bank;

5. Downsampling and Upsampling; Matrices for downsampling and upsampling;

6. Subsampling in the frequency domain; Sampling operations in the z-domain; Scaling functions and wavelets;

7. Discret Wavelet Transform (DWT) and Fast Wavelet Transform (FWT);

8. The Haar coefficients; Application: a FB with two channels;

9. Perfect reconstruction; Spectral Factorization;

10.-11. Orthogonal filter banks; Halfband filters;

12, Maxflat (Daubechies) filters; Biorthogonal wavelets;

13. Image compression; Distortion in image compression;

Literature:

G. Strang, and T. Nguyen, Wavelets and Filter Banks, Wellesley-Cambridge Press:Wellesley, MA (1996)

Recommended literature:
1. R. M. Rao, A. S. Bopardikar, "Wavelet transforms: introduction to theory and applications," Addison-Weslsy: Reading, MA (1998)
2. M. Vetterli, and J. Kovacevic, "Wavelets and subband coding," Prentice Hall: New Jersey (1995)
3. C. S. Burrus, R. A. Gopinath, H. Guo, "Introduction to wavelets and wavelet transforms, a primer," Prentice Hall: New Jersey (1998)