

EL 716: Multiresolution Signal Decomposition (Wavelets and Filter Banks)

Fall 2005

Room and meeting time

RH 602
Wednesday 3:30 - 5:45

Description

This course will study wavelet transforms from a DSP perspective. As wavelet transforms are generally computed using filter banks, the close relationship between wavelet transforms and filter banks will be a central part of the course. Matlab exercises will also be a part of this course.

Text

Wavelets and Subband Coding by Martin Vetterli and Jelena Kovacevic.
Publisher: Prentice Hall. ISBN: 0-13-097080-8

Supplemental Text

Introduction to Wavelets and Wavelets Transforms by: C. Sidney Burrus, et al.
Publisher: Prentice Hall. ISBN: 0-13-489600-9

Prerequisites

EL 713: Digital Signal Processing

Homework

HW assigned in one class will be collected in the next class session.

Web

<http://taco.poly.edu/selesi/EL716/>

Software

Students who wish to work on Matlab at home can purchase the student version of Matlab at the bookstore. If it is not there, ask them to order a copy for you. Or you can download it from www.mathworks.com. Students who buy the student version of Matlab from the Mathworks for home use should also buy the Signal Processing Toolbox.

Matlab manuals are available in PDF format at www.mathworks.com.

Grading

Homework	25%
Midterm	25%
Project	25%
Final	25%

Topics

1. Introduction to wavelets
2. The scaling function and dilation equation
3. Construction of wavelets (Daubechies' wavelets)
4. Multirate systems and filter banks
5. Implementing the discrete wavelet transform (Mallat's algorithm)
6. Tiling the time-frequency plane
7. Symmetric biorthogonal wavelet bases
8. Lattice structures and parameterizations
9. Lifting implementations of wavelet transforms
10. Two-dimensional wavelet transforms
11. Wavelet-based signal denoising
12. Expansive wavelet transforms

Instructor

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Office hours: Tuesday 4:00-5:00 pm; Thursday 5:00-6:00 pm.