DSP

Introduction

Mehdi Rezaei
Dept. of Electrical and Computer Engineering
University of Sistan & Baluchestan

Course Outline

- Introduction to Digital Signal Processing
- Discrete-Time Signals and System (2 Weeks)
  - Discrete-Time Signals: Sequences (2.1)
  - Discrete-Time Systems (2.2)
  - Linear Time-Invariant Systems (2.3)
  - Properties of Linear Time-Invariant Systems (2.4)
  - Linear Constant-Coefficient Difference Equations (2.5)
  - Freq. Domain Representation of Discrete-Time Signals (2.6)
  - Representation of Sequences by Fourier Transforms (2.7)
  - Symmetry Properties of the Fourier Transform (2.8)
  - Fourier Transform Theorems (2.9)
- The Z-Transform (2 Weeks)
  - Z-Transform (3.1)
  - Properties of the Region of Convergence of the z-Transform (3.2)
  - The Inverse Z-Transform (3.3)
  - Z-Transform Properties (3.4)

Course Outline

- Sampling of Continuous-Time Signals (2 Weeks)
  - Periodic (Uniform) Sampling (4.1)
  - Frequency-Domain Representation of Sampling (4.2)
  - Reconstruction of a Band limited Signal from Its Samples (4.3)
- Transform Analysis of Linear Time-Invariant Systems(2Weeks)
  - The Frequency Response of LTI Systems (5.1)
  - Constant-Coefficient Difference Equations (5.2)
  - Frequency Response for Rational System Functions (5.3)
  - Relationship between Magnitude and Phase (5.4)
  - All-Pass Systems (5.5)
  - Minimum-Phase Systems (5.6)

Course Outline

- Structures for Discrete-Time Systems (2 Weeks)
  - Block Diagram Representation (6.1)
  - Signal Flow Graph Representation (6.2)
  - Basic Structures for IIR Systems (6.3)
  - Transposed Forms (6.4)
  - Basic Structures for FIR Systems (6.5)
  - Finite Precision Numerical Effects (6.6)
  - Effects of Coefficient Quantization (6.7)
  - Effects of Round-Off Noise in Digital Filters (6.8)
- Filter Design Techniques (2 Weeks)
  - Design of Discrete-Time IIR Filters from Continuous-Time Filters (7.1)
  - Design of FIR Filters by Windowing (7.2)
  - Optimum Approximation of FIR Filters (7.4)

Course Outline

- The Discrete-Fourier Transform (2 Weeks)
  - Discrete Fourier Series (8.1)
  - Properties of the Discrete Fourier Series (8.2)
  - The Fourier Transform of Periodic Signals (8.3)
  - Sampling the Fourier Transform (8.4)
  - The Discrete Fourier Transform (8.5)
  - Properties of the DFT (8.6)
- Computation of the Discrete-Fourier Transform (1 Weeks)
- Student Presentations and Project Check (1 Weeks)

Course Details

- Objective
  - Establish a background in Digital Signal Processing Theory
- Required Text
  - Discrete-Time Signal Processing, Prentice Hall, 2 or 3nd Edition, Alan Oppenheim, Ronald Schafer, John Buck
- Grading for BSc Students
  - Midterm: 5 Points
  - Final: 10 Points
  - Homework, Quiz, Attendance: 5 Points
- Grading for MSc Students
  - Midterm 1: 5 Points
  - Midterm 2: 5 Points
  - Final: 10 Points
  - Presentation of Selected Topics: 2 points (Extra)
    - Matlab SP Toolbox
    - DSP Processors and Platforms

Useful References

- Text Books
  - "Discrete-Time Signal Processing," 3e or 2e by Oppenheim, Shafer, and Buck, Prentice Hall Inc.
  - "DIGITAL SIGNAL PROCESSING: Principles, Algorithms, and Applications", *John G. Proakis , Dimitris G. Manolakis*.
  - "DIGITAL SIGNAL PROCESSING USING MATLAB" , *Vinay K. Ingle, John G. Proakis* .
  - "Schaum's Outline of Theory and Problems of Digital Signal Processing", *Monson H. Hayes.*
  - *…*

- Web Sites
  - Course slides at: http://vu.usb.ac.ir (ID:dsp90 , PW:vudspasd90)
  - www.google.com
  - http://www.jhu.edu/signals/index.html