



E9-202 Aug 3:0

Advanced DSP: Non-linear Filters

Instructor

Prof.T.V. Sreenivas

Email: tvsreenivas@gmail.com

Teaching Assistant

Email:

Department: ECE

Course Time: T, Th, 2-3.30pm

Lecture venue: ECE 1.07

Detailed Course Page:

Announcements

Brief description of the course

The course is meant for PG students of ECE. It introduces optimal estimation as filtering and optimality under non-Gaussian (Laplacian & Cauchy) noise as leading to median filter and myriad filters. A variety of median filters and myriad filter as an extension of linear filter are discussed. Stack filter as a generalization of median filter and its boolean logic implementation are shown. Also 2D and polynomial filters are introduced for their special properties.

Prerequisites

- i) Digital Signal Processing
- ii) Basic probability and statistics

Syllabus

- i) Mean, Median, Mode filtering as optimal filters for Gaussian, Laplacian and Cauchy noise conditions
- ii) Generalization of Median Filter: recursive, rank-order, weighted, adaptive
- iii) Threshold decomposition, stack filters, Boolean logic realization
- iv) Mallows Theorem: linear to non-linear smoothers/filters

v) L-estimator, 2D L-ell filters; polynomial filters

Course outcomes

This course expands the horizon of signal processing and communication students to non-linear techniques and their optimality, deviating from the predominantly Gaussian.linear analysis of signals and systems.

Non-filters are also power efficient and are based on sorting and boolean logic implementations.

Grading policy

20% project, 30% mid-term tests, 50% final exam

Assignments

Resources

i) GR Arce : Non-linear signal processing: A statistical approach, 2004

ii) Astola and Kuosmanen : Fundamentals of non-linear digital filtering, 1997