Lesson 1: Introduction, Median Filtering

Nonlinear Signal Processing – SS 2017

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Session contents

- Course logistics
- Short intro: Median vs. mean filtering
Course Logistics (1)

- We’ll have about seven meetings → up-to-date information in TUGonline (here or in HS i12, attendance is not mandatory)

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Course Logistics (2)

- Information sources:
  - Course homepage (handouts, matlab files, …)
    http://www.spsc.tugraz.at/courses/nonlinearsignalprocessing
  - Newsgroup: tu-graz.lv.nl-signalprocessing
  - One handout per major topic block (Intro, Static NL, Fading-memory NL, NL dynamical systems)
  - Contain problems to be solved together in class
  - Also contain homework problems (marked with a house icon)
Course Logistics (3)

- You are encouraged to work in pairs (just one report per pair has to be handed in!)
- You have to hand in a report at the end of the semester
- Contains results, plots, discussion, interpretation for homework problems
- Deadline is TBA/TBD
- Mail all your Matlab files to me
- Basis for grading is the report
Intro: Mean vs. Median filtering

- For both filters: Consider data samples within a window
- Mean: Compute (sliding) average of samples $\rightarrow$ linear
- Median: Replace current sample by median within window $\rightarrow$ non-linear

\[ SNR = 10 \log_{10} \frac{\sum_n signal^2[n]}{\sum_n noise^2[n]} \]

$\rightarrow$ Compute a SNR$_{in}$ as well as a SNR$_{out}$!
$\rightarrow$ What is noise$[n]$ before/after the filter?
Nonlinear Transformations – Problem 1.4

- Problem 1.4: A first glance at a nonlinear transformation

- Sensor measures range $r$ and angle $\theta$ to a target
- Estimate the position in Cartesian coordinates
- What do we expect? What happens if sensor values are noisy?