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Signal Processing

Winter semester 2018/2019

Lab 1
1D Convolutions

Graphical and Analytical Convolution

1.1. Convolve graphically the following functions $u(t) * h(t) = g(t)$ and draw *u(t)*, *h(t)* and *g(t)*.
Hint: use time shifts $\Delta t = 0.5$ for the graphical convolution.

- $rect\left(\frac{(t - T_1)}{T_1}\right) * rect\left(\frac{t}{T_2}\right)$ with $T_1 = 2$ and $T_2 = 3$
- $rect\left(\frac{t}{T}\right) * (-2\gamma(t))$
- $[2\ \delta(t + 2T) + 3\ \delta(t + T) - 2\ \delta(t) + \delta(t - T)] * tri\left(\frac{t}{T}\right)$

1.2. Convolve graphically and analytically:

- $\left(\cos(t) \cdot rect(\frac{t}{\pi})\right) * \gamma(t)$

Discrete Convolution of two Signals

2.1. We are given the discrete signal [..., 0, 0, 0, 1, 3, 1, 0, 0, 0, ...].
Compute (by hand) the discrete convolution of the signal with itself.
Use both methods we have discussed in the lab.

2.2. We are given the two discrete signals x = [..., 0, 1, 0, 1, 0, 1, ...] and
h1 = 0.5 × [..., 0, 0, 0, 1, 1, 0, 0, 0, ...].
Compute (by hand) the convolution of the two signals.

2.3. We are given the discrete signal h2 = [..., 0, 0, −1, 0, 1, 0, 0, ...].
Compute (by hand) the discrete convolution of the signals x (see 2.2.) and h2.

Deadline: Tuesday, 27th November 2018

Please, submit only one report per group. Submission in digital manner as PDF document). Send report via mail to dominik.laupheimer@ifp.uni-stuttgart.de. Please, comply with the following naming convention: SigProc-Lab1-NAME1-NAME2.pdf