Exercise Sheet SoSe 2014
Wirtschaftsinformatik und Maschinelles Lernen (ISMLL)
Prof. Dr. Dr. Lars Schmidt-Thieme, Carlotta Schatten, M.Eng.

Exercise Sheet Image Processing 7

Submission: 01.07.14 09:00

Exercise 1 Haar Wavelets (11 Points)

a) Given f = (4,7,2,-5,6,7,4,2) compute the Haar wavelet transform of the signal giving all coefficients $a_{s,t}$ and $c_{s,t}$. (5 Points)

b) Plot all wavelet basis functions $\psi_{s,t}(x)$ for all valid s and t of the signal computed in a). (3 Points)

c) What is the mathematical concept behind the computation of the Haar coefficients? Why is it important? Which other transform use the same concept? (3 Points)

Exercise 2 Fourier Transform (8 Points)

a) Compute the Fourier transform of the following function:

$$f(x) = xu(x), \tag{1}$$

where

$$u(x) = \begin{cases} 0 & -\infty \leq x < 0 \\ 1 & 0 \leq x \leq \pi \end{cases} \tag{2}$$

(4 Points)

b) Compute the complex Fourier serie of the following signal with period 2π

$$f(x) = \exp^{-2x+4} u(x-2) \tag{3}$$

where

$$u\,(x) = \begin{cases} 0 & -\infty < x < 0 \\ 1 & 0 \leq x < \infty \end{cases} \tag{4}$$

(4 Points)