Exercise Sheet SoSe 2014
Wirtschaftsinformatik und Maschinelles Lernen (ISMLL)
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Exercise Sheet Image Processing 05

Submission: 10.06.14 09:00am

Exercise 1 Theory (4 Points)

a) How does the function represented by the Fourier Transformation change by increasing or decreasing the number of coefficients considered? Is the Fourier Representation always accurate? (2 Points)

b) Describe the characteristics of the Dirac Function? What is its main role? (2 Points)

Exercise 2 Fourier Transformation Exercises (15 Points)

a) Given are the functions

$$f(x) = \begin{cases} 0 & -5 \leq x < 0 \\ 3 & 0 \leq x \leq 5 \end{cases} \tag{1}$$

with period 10 and the function

$$f(x) = x^2 \tag{2}$$

with period $2\,\pi$. Compute their Fourier coefficients and the corresponding real Fourier Series.

(5 Points)

b) Compute the Fourier transformation of the following functions:

$$f(x) = \exp^{-\alpha t}\, u(x) \tag{3}$$

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

where

$$u(x) = \begin{cases} 0 & -\infty < x < 0 \\ 1 & 0 \leq x < \infty \end{cases} \tag{5}$$

(5 Points)

c) Compute the complex Fourier Series and coefficients of the following function:

$$f(x) = \frac{A}{T/2}t,\ |t| < T/2 \tag{6}$$

(5 Points)