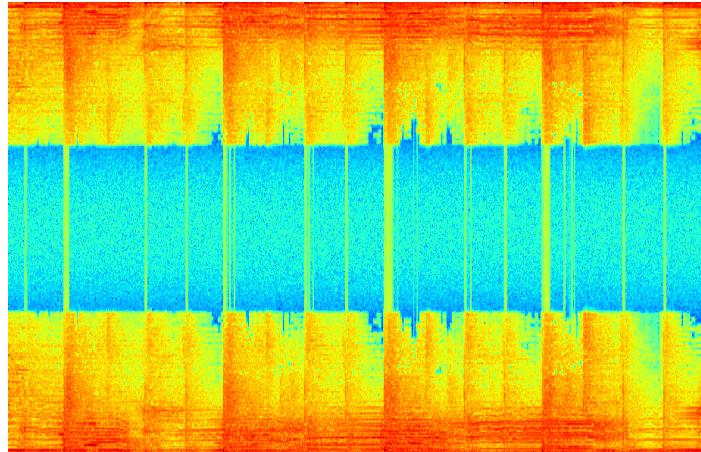


FC1.6 Signal/image processing



Supervisors: **André Ferrari**

Contact

✉ ferrari@unice.fr

☎ +33 4 92 07 63 49 (supervisor)

🌐 <http://www-n.oca.eu/aferrari>

Bibliography / links

Oppenheim, A. V., & Schafer, R. W. (2009). Discrete-Time Signal Processing. Prentice Hall Press.

Gonzalez, R. C., & Woods, R. E. (2001). Digital Image Processing. Addison-Wesley Longman Publishing.

Contents

The objective of this course is to present the fundamental mathematics and concepts of discrete-time signal and image processing. These topics are presented in the context of signal processing and extended to image processing. A large part of the course will be devoted to computer implementation of signal and image processing systems.

Chapter 1: Discrete-Time Signals and Systems

1. LTI Systems. Linear Constant-Coefficient Difference Equations
2. Representation of Sequences by Fourier Transforms
3. Frequency-Domain Representation of Sampling
4. Frequency-Domain Representation of Discrete-Time Systems

Chapter 2: The z -Transform and Filter Design

1. z -Transform Properties. Properties of the ROC
2. z -Transforms and LTI Systems
3. Design of Discrete-Time IIR Filters and design of FIR Filters

Chapter 4: The Discrete Fourier Transform

1. Representation of Periodic Sequences: The Discrete Fourier Series
2. Fourier Representation of Finite-Duration Sequences
3. Properties of the DFT, Linear Convolution Using the DFT
4. The Discrete Cosine Transform (DCT)
5. Direct Computation of the Discrete Fourier Transform and FFT Algorithms
6. DFT Analysis of Sinusoidal Signals Using the DFT

Chapter 5: Applications to image processing

1. Convolutions in Space Domain and Fourier Domain
2. Matrix Representation of Convolution and pProperties
3. Image filtering
4. Introduction to Wavelets and Multiresolution Processing

Practical work

A large part of the course is devoted to practical projects, where the students will code various algorithms and compare theoretical results with simulation results. Students will have to complete two projects during the course and are welcomed to work in pairs and to submit a single document. The computations will be preferentially carried out in julia or python.