

Informatique

Signal and image analysis

IDENTIFICATION

CODE : BS-5-S1-EC-COIMAGE
ECTS : 2.0

HOURS

Lectures : 14.0 h
Seminars : 12.0 h
Laboratory : 0.0 h
Project : 0.0 h
Teacher-student
contact : 26.0 h
Personal work : 24.0 h
Total : 50.0 h

ASSESSMENT METHOD

Week 3: written report on a case study in low / medium level,
Week 6: written report on a case study in high-level,
Week 7: oral presentation of a finalized quantitative analysis of images.

TEACHING AIDS

TEACHING LANGUAGE

English

CONTACT

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AIMS

This course introduces digital image processing. It focuses on the theory and algorithms underlying a range of tasks including acquisition and formation, enhancement, segmentation, and representation.

Course Learning Outcomes: By the end of this course, students will be able to:

- Explain how digital images are represented and manipulated in a computer, including reading and writing from storage, and displaying.
- Write a program which implements fundamental image processing algorithms.
- Be conversant with the mathematical description of image processing techniques and know how to use image processing libraries.

CONTENT

Digital Image Fundamentals

- Elements of Visual Perception.
- Light and the Electromagnetic Spectrum.
- Image Sensing and Acquisition.
- Image Sampling and Quantization.
- Some Basic Relationships between Pixels.
- Linear and Nonlinear Operations.

Image Enhancement in the Spatial Domain

- Basic Gray Level Transformations.
- Histogram Processing.
- Basics of Spatial Filtering.
- Smoothing Spatial Filters.
- Sharpening Spatial Filters.

Image Segmentation

- Detection of Discontinuities.
- Edge Linking and Boundary Detection.
- Thresholding.
- Region-Based Segmentation.
- Segmentation by Morphological Watersheds.

Morphological Image Processing

- Dilation and Erosion.
- Opening and Closing.
- Extensions to Gray-Scale Images.

BIBLIOGRAPHY

1. Murat Kunt, Techniques modernes de traitement numérique des signaux (Masson)
2. Jean-Noël Martin, Débuter en traitement numérique du signal - Applications au filtrage et au traitement des sons (Collection TechnoSup, éditions Ellipses)
3. Image J : freeware for image treatment and analysis (official website :<http://rsbweb.nih.gov/ij/index.html>, description : <http://fr.wikipedia.org/wiki/ImageJ>)
4. Diane Lingrand, Introduction au Traitement d'Images (Vuibert)
5. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing (Addison-Wesley)
6. David Forsyth, Jean Ponce, Computer Vision: A Modern Approach (Prentice Hall)

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