Last update: 06-05-2019

230024 - PIV - Image and Video Processing

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 739 - TSC - Department of Signal Theory and Communications

Academic year: 2019

Degree: BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)

ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Philippe Salembier Clairon
Gasull Llampallas, Antoni

Others: Gasull Llampallas, Antoni
Oliveras Verges, Albert
Pardas Feliu, Montserrat
Salembier Clairon, Philippe

Requirements

INTRODUCTION TO AUDIOVISUAL SIGNAL PROCESSING - Prerequisite

Degree competences to which the subject contributes

Generical:

10 ECI N3. They will have acquired knowledge related to experiments and laboratory instruments and will be competent in a laboratory environment in the ICC field. They will know how to use the instruments and tools of telecommunications and electronic engineering and how to interpret manuals and specifications. They will be able to evaluate the errors and limitations associated with simulation measures and results.

Teaching methodology

Theoretical Lecture
Lab session
Group work
Individual work
Mid-term control
Final exam

Learning objectives of the subject

The goal of this course is to introduce the most important image and video processing techniques.
The Processing techniques are presented building from concepts that the students have encountered in previous courses (in particular "Signals and Systems" and "Introduction to AV signal processing") . The course presents a wide range of real applications. Moreover, the students will also have the opportunity to design and develop a complete image processing applications.

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Study load

Total learning time: 150h	Hours large group:	39h	26.00%
	Hours small group:	26h	17.33%
	Self study:	85h	56.67%

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Content

Topic 1. Pixel-based image representation

Learning time: 12h
Theory classes: 6h
Self study : 6h

Description:
Pixel-based model: Luminance and color,
Practical study 1: Visualisation Equalisation
Practical study 2: Image search

Topic 2. Space-frequency representation of images

Learning time: 22h 20m
Theory classes: 5h
Laboratory classes: 4h
Self study : 13h 20m

Description:
Image filtering, 2D convolution and correlation. Practical study: Restoration
Fourier analysis DCT, DFT. Practical study 2: Resolution
Multiresolution: Pyramid & Wavelet. Practical study: Noise reduction

Topic 3. Geometric model for images

Learning time: 26h 20m
Theory classes: 9h
Laboratory classes: 2h
Self study : 15h 20m

Description:
Geometrical transforms, Practical study 1: Image registration
Hough transform, Practical study 2: Road detection in remote sensing, Soccer field analysis
Mathematical morphology, Practical study 3: Biomedical and industrial applications.

Topic 4. Region-based image representation

Learning time: 17h 20m
Theory classes: 5h 20m
Laboratory classes: 2h
Self study : 10h

Description:
Contour-texture image model, Segmentation
Practical study: Biomedical applications, Photography, Unsupervised segmentation, object interaction

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Topic 5. Video processing	Learning time: 32h 40m Theory classes: 12h 20m Laboratory classes: 2h Self study : 18h 20m

Description:
Pixel-based model. Practical study 1: Surveillance system.
Space-frequency model. Practical study 2: Mosaic creation.
Geometrical model. Practical study 3: Video restoration
Region-based model. Practical study 4: Shot detección, object tracking.

Topic 6. Design and implementation of an image processing system	Learning time: 33h 30m Laboratory classes: 14h Self study : 19h 30m

Description:
Design and implementation of an image processing system

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Planning of activities

Short answer test (Control)	Hours: 1h Theory classes: 1h
Description: Continous evaluation	

Lab session	Hours: 2h Theory classes: 2h
Description: Low-level image representation - the Pixel	

Lab session	Hours: 2h Theory classes: 2h
Description: Space-frequency representation of images	

Lab session	Hours: 2h Theory classes: 2h
Description: Shape and image - geometric structures	

Lab session	Hours: 2h Theory classes: 2h
Description: Region-based processing	

Lab session	Hours: 2h Theory classes: 2h
Description: Video processing	

Lab session	Hours: 6h Laboratory classes: 6h
Description: Design and implementation of an image processing system	

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Final Exam	Hours: 2h Theory classes: 2h
Description: Final exam	

Qualification system

Final exam: 40%
Control: 20%
Lab session: 40%

Bibliography

Complementary:

González, R.C.; Woods, R.E. Digital image processing. 3rd ed. Harlow: Pearson Prentice Hall, 2008. ISBN 9780131687288.

Others resources:

Lectures notes and Problems collection.