CIMET Advanced Colorimetry

Course name: Advanced Colorimetry **Course code:** CIMET AC
Course level: Master **ECTS Credits:** 5.00

Course instructors: Manuel Melgosa and Rafael Huertas (University of Granada)

Education period (Dates): 2nd semester **Language of instruction:** English

Prerequisite(s): Module "Color Science" (1st semester), Module "Human Vision and Computer Vision" (2nd semester)

Aim and learning outcomes:

To supply an introduction color difference models and color appearance models, their evolution and present development. Also, basic knowledge on color reproduction methods and perceptual and physical evaluation of color images.

On completion of this course the students will be able to:

- Describe the color difference models.
- Describe the perceptual attributes of colour and the different systems for the representation of colour
- Demonstrate the use of colour measurement instruments and the interpretation of colour measurement data
- Demonstrate the computation of uniform colour space coordinates from reflectance measurements
- Describe the requirements for consistent colour reproduction across different media.
- Practical implementation of measurements of the appearance.
- Skills on methods of evaluation of the quality of color images.
- Basic methods of color reproduction on the industry.

Topics to be taught:

- Weighted color difference equations. Color tolerance experiments. CIE94 and CIEDE2000 color-difference formulas.
- Effects of viewing conditions. Achromatic adaptation models. The structure of chromatic adaptation (CAT) models.
- The appearance attributes of colored materials viewed against a neutral grey background. The appearance attributes of colored areas within images. The influence of surrounding and background color on the appearance of a central color element.
- The structure of color appearance models: CIECAM97's, CIECAM02. CAM implementation. CAM testing.
- S-CIELAB color-difference formulae. Image appearance models: iCAM
- Visual appearance(color + gloss, translucency and texture)
- Visual color matching. Instrumental color matching. Image color matching. Introduction to psychophysical methods of assessing of the perceived quality of images.
- Management of the transfer of color information between image capture devices and image production devices. Device characterization, Gamut mapping algorithms, Device calibration. Concepts of device dependent and device independent methods of color specification.
- Image quality Measurements. Rendering HDR Images
- Whiteness Measurements. Industrial Colorimetry.

Teaching methods: Lectures and lab classes, and homework exercises.

Form(s) of Assessment: Written exam (75%), exercises (25%)
Literature and study materials: Handouts of the material covered in the lectures will be distributed.

Reference book:

M.D. Fairchild, Color Appearance Models, Second Edition, Wiley-IS&T Series in Imaging Science and Technology, Chichester, UK (2005).
R. S. Berns, Billmeyer and Saltzman, Principles of Color Technology, 3rd ed., John Wiley & Sons, New York, (2000).
W.D. Wright, 50 years of the 1931 CIE standard observer for colorimetry, AIC Color 81, Paper A3 (1981).
G. Wyszecki, Current developments in colorimetry, AIC Colour 73, 21-51 (1973).

Additional books:

Digital color management: Encoding Solutions, E. Giogianni & T. Madden, Addison Wesley, (1992).
Colour Engineering, Achieving device independent colour, P. Green & L. MacDonald, John Wiley and Sons Ltd, (2002).
The reproduction of colour, R.W.G. Hunt, Foutain Press, (1995).
Colour physics for industry, R. McDonald, Society of Dyers & Colourists, (1997).

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