Study program: Artificial intelligence

Name of the subject: Introduction to image processing

Teacher(s): Oskar Marko, Marko Panić

Status of the subject: elective

Number of ECTS credits: 5

Conditions: none

Subject goal

Introduction to theories, algorithms, and practical solutions of digital image/video perception, acquisition, color representation, quantization, transform, enhancement, filtering, multi-spectral processing, restoration, analysis, feature extraction, segmentation, morphological transform, and compression.

Outcome of the subject

Students will gain understanding of algorithm design, mathematical tools, and practical implementations of various digital image applications. Considerations of practical system requirements (e.g., medical, satellite, consumer) will be discussed. Related standards such as JPEG and MPEG will be reviewed

Subject content

Theory

Introduction, Image Representation; Color Space, Image Sampling; Quantization, Image Quality Measurement; Image Quality Enhancement, Discrete Fourier Transform; Frequency-Domain Filtering, Image Transform; Discrete Cosine Transform, KL Transform; Image Restoration; Image Feature; Extraction and Representation: Edge and Line; Region Segmentation and Representation; Morphological Image Processing; Image and Video Compression; Object Recognition

Practical learning

Application examples in computer vision, medical applications, satellite systems, etc.

Expert from the industry will be included into the project assignment realization as an external tutor.

Literature

Selected parts of the following books:

1. Gonzalez and Woods, Digital Image Processing, 2nd edition, Prentice Hall, 2001.
2. Vaclav Hlavac, Roger Boyle, Milan Sonka, Image Processing, Analysis, and Machine Vision: 3rd (Third) edition Hardcover – March 19, 2007
3. Matlab is the recommended tool for the class. Software examples will be shown in class.

Number of active teaching classes	**Theoretical teaching: 2**	**Practical teaching: 2**

Method of carrying out the teaching

Lectures; revisions of the material; active students' participation in problem solving; knowledge tests – colloquia; homeworks.

Evaluation of knowledge (maximum number of points 100)

Pre-exam obligations	points	**Final exam**	points
Colloquia	30	Written exam	40
Homeworks	30		