# Digital Image Processing

Syllabus Number 4E206
Special Subjects
Elective 2 credit

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1. Course Description

This course provides you to learn about digital image processing technology which is one of the primary media technology for ICT. You will learn on basic method, theory and element technology for handling images with computer. Moreover, you will deepen your understanding of the general principles of the This course provides you to learning about digital image processing technology which is one of the primary media technology for ICT. You will learn on basic method, theory and element technology for handling images with computer. Moreover, you will deepen your understanding of the general principles of the image processing, by actually applying some image processing algorithms to an image to compare and confirm those effects.

The lecturer covers the general principle and the algorithms of image sampling and quantization, color, point operations, segmentation, morphological image processing, linear/non-linear image filtering and correlation, image transforms, noise reduction, and pattern matching.

This course follows DP4 in the diplomat policies of the faculty.

2. Course Objectives

By end of this course, you will be able to:
(1) understand and explain about the structure of a digital image
(2) understand and explain the general principle and the algorithm of image filtering and processing techniques
(3) understand and explain the effects obtained as a result of applying algorithms to an image.

3. Grading Policy

You will be graded by your submitted reports (50%) and final examination marks (50%).
Reports are returned afterwards with comments.

4. Textbook and Reference

Textbook
Editing committee for Digital Image Processing Digital Image Processing [Revised version] (Japanese) CG-ARTS Association
Reference
Supplementary English materials will be provided if necessary.
Presentation files are uploaded to the lecturer's web site.

5. Requirements(Assignments)

Prior to each lecture, read the corresponding part of the textbook and presentation material carefully. This preparation requires more than 1.5hr.
If there is an assignment at the end of the presentation material, work on it (which would require another 1.5hr˜).

6. Note

We use GNU Octave as for programming language/environment.

7. Schedule

[1] Introduction (Guidance, how to use GNU Octave)
[2] What is 'digital image'? (Image and media, static image, file formats, coordinates)
[3] Sampling theorem (Sampling, quantization)
[4] Properties of digital images and color (Color space, contrast transformation)
[5] Geometric transformation (Linear transformations: scaling, rotation, reflection)
[6] Geometric transformation (Affine transform)
[7] Geometric transformation (Image resampling, interpolation)
[8] Spatial filtering 1 (Smoothing, edge detection)
[9] Spatial filtering 2 (Sharpening, smoothing with edge preservation)
[10] Fourier transform of images
[11] Frequency filtering (Low-pass filter, high-pass filter, band-pass filter)
[12] Image restoration and generation (Restoration of blur/shake, noise reduction)
[13] Binary image processing
[14] Pattern detection and matching (Template matching, etc.)
[15] Summary and review. Ask any questions to the lecturer.