

# Digital Image Processing

Syllabus Number

3D228

Special Subjects

Elective 2 credit

HAMADA, koichi

## 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 DP4M 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 grades and comments.

## 4. Textbook and Reference

Textbook

Textbook: "Digital Image Processing" by CG-ARTS Association (Japanese).

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 carefully and answer the worksheet. Worksheets are collected at the beginning of each lecture. This preparation requires more than 1.5hr. You will be given an assignment which requires another 1.5hr ~ work time.

## 6. Note

This lecture will be conducted in a computer-equipped classroom.

## 7. Schedule

- |      |   |
|------|---|
| [1]  | Introduction (Guidance, how to use MATLAB)  |
| [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  |