

# Basic Image Processing and Geometry

Syllabus Number 2G112  
Special Subjects  
Elective 2 credit  
YOSHITANI, Naoharu

## 1. Course Description

Techniques of image processing and geometry have become familiar to everyone because of wide-spread use of computers, digital cameras and various software in this field. Image processing means to modify brightness, contrast, sharpness or color of an image, or to extract the image characteristics. The processing of image geometry means to enlarge, shrink, or rotate an image. This course consists of lectures in the classroom with exercises of practical problems, and laboratory work in the computer laboratory (CL).

Students are expected to acquire the knowledge and techniques related to DP1.

## 2. Course Objectives

Important contents to be learned in this course are:

1. introduction to digital data and digital images
2. basics of digital image: data structure, data size, RGB primary colors,
3. basics of various image processing
4. basics of image geometry processing
5. outline of data compression techniques

The objective of this course is to learn and understand the above course contents and to be able to apply these to basic applications.

## 3. Grading Policy

Grading policy is based on the results of final examination (60%), on exercise answers at each class (15%), and on the reports of laboratory work (25%).

## 4. Textbook and Reference

Textbook

Hironao Yamada (山田 宏尚) Digital image processing from the start, revised edition (はじめてのデジタル画像処理 増補改訂版)

Gizyutsu-Hyouron publishing Co., (技術評論社) ISBN978-4774195759

Reference

none

## 5. Requirements(Assignments)

The course requires basic arithmetic. The course does not require advanced mathematics nor information science.

## 6. Note

The course is helpful to everyone in handling or processing various digital images.

## 7. Schedule

- [1] Introduction to digital image and image processing
- [2] Digitization of analog image: sampling and quantization
- [3] Binary, octal and hexadecimal figures: expression and mutual transformation
- [4] Digital color image (1): RGB primary colors, CMYK colors, data structure and data size of digital image
- [5] Digital color image (2): digitization of color image, data structure and data size
- [6] Digital image filtering (1): moving average, weighed average, median filter, linear filtering technique,
- [7] Digital image filtering (2): edge extracting filter, sharpening filter
- [8] Brightness/tone modification: gradation histogram, tone curve
- [9] Image processing for printing: half-tone, dithering, error diffusion method
- [10] Image geometry processing: affine transformation (enlarge, shrink, translate, rotate)
- [11] Laboratory work (1): basic image processing (smoothing, sharpening, edge extraction, binarization)
- [12] Laboratory work (2): advanced image processing, image geometry processing, structure of image files
- [13] Image data compression (1): RLE compression, Huffman encoding
- [14] Image data compression (2): JPEG compression
- [15] review and exercises, examination