

31651 – ImProc (Image Processing)

Lecturers: Dr. Samuel Kosolapov

Credits: 4 points

Hours: 2 lecture, 1 tutorial, 3 laboratory

Grade Composition:

CMW – Class Micro-Works

L - Laboratory

MP1 – Micro Project #1

MP2 – Micro Project #2

$$A = 0.5*L + 0.2*MP1 + 0.3*MP2$$

$$\text{Final Grade} = G = \text{MAX} (0.2*CMW + 0.8*A , A)$$

Prerequisites: 31440 Introduction to Processing of the Digital Systems

Course Description:

This course is about storing, processing and presentation of the images by using digital algorithms. Basic algorithms are explained during frontal lectures . In the frames of the course' laboratory, students implement a selection of the Image Processing algorithms by using Visual Studio (C, C++, C#, .NET). Two micro-projects implemented by pair of students deals with additional algorithms that were explained during the lectures without implementation details.

Course Content:

1. Basic properties of the human visual system. Pixel.
2. Computer presentation of the Gray and RGB images as arrays.
3. Creating a set of synthetic test images by using C and C++.
4. Contrast and Brightness.
5. Pixel-to-Pixel operations: Contrast stretch, Automatic Min-Max contrast stretch, Histogram Equalization. Usage of LUT and pointers for fast implementation of pixel-to-pixel operations.
6. Geometrical Transformations: scaling, rotation, Affine Transform. Image registration.
7. Median filtration.
8. Filtration by convolution. Gaussian filter.
9. Usage of FFT for Image Processing. Unsharp Masking.
10. Edge detectors.
11. Usage of MATLAB for fast prototyping Image Processing systems.
12. Design and properties of digital camera.

Bibliography:

1. The Image Processing Handbook. 5nd Edition. John C. Russ. CRC Press, 2007
2. Computer Graphics. Principle and Practice. Second Edition in C
Foley, van Dam, Addison-Wesley, 1995
3. Digital Image Processing. Third Edition. Rafael C. Gonzalez, Richard E. Woods,
Pearson Education Inc., 2008
4. Computer Vision. Principles and Practice. 1st Edition. Pedram Azad, Tilo Gockel,
Rudiger Dillmann, Elector International Media BV, 2008

Learning Outcomes:

After learning the theory provided in the lectures and tutorials, and after executing home works and micro projects, the student will be able to implement basic Image Processing algorithms as a software utilities for PC.

Consultation hours: Wednesday 14:50 - 15:40, EM425

Note: This is not a contract. Written and verbal instructions may override any part of this course outline.

Last Update: October 2019

Signature of Lecturer  Date 2019-10-10

Signature of Head of Department _____ Date _____