Real time processing of conventional and non-conventional images with GPUs, 5 ECTS - UJM semester 2

Learning outcomes

This course introduces basic and advanced techniques dedicated for General-Purpose processing on Graphics Processing Unit (GPGPU). It introduces the basic concepts of parallel programming and shows how to use the computing power of modern GPUs for conventional/non-conventional images processing in real time.

Content

- Introduction to parallel programming
- Introduction to General-purpose processing on graphics processing units (GPGPU):
    - GPGPU with shaders
    - CUDA
- Image processing with graphic shaders and compute shaders (application with WebGL for web applications)
- CUDA based image processing (application with OpenCV for native applications)
- Case of studies:
    - Implementation of conventional color image/video processing methods
    - Implementation of non-conventional image processing methods

Modes of study

Course and project work, active participation

Teaching methods

- Lectures: 15 hours
- Practical work (during the lectures): 26 hours
- 3 days development sprint

Study materials

- Programming Massively Parallel Processors, Third Edition: A Hands-on Approach, by David B. Kirk and Wen-mei W. Hwu, December 2016
- Hands-On GPU-Accelerated Computer Vision with OpenCV and CUDA: Effective techniques for processing complex image data in real time using GPUs, Bhaumik Vaidya, Packt Publishing, 2018
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Evaluation criteria

(Written exam / written assignments / project work / …)

1 theoretical examination (1h30, 1/2), 1/2 project (3 days sprint included)

Scale to be defined

Prerequisites

- Real time 3D visualization
- C or C++ programming