

High Performance Video Coding

New Offers for Bachelor / Master Thesis

Keywords: Video Coding, HEVC/H.265, 4K/8K video, performance optimization

- Perceptual Encoding Optimization for 4K/8K Videos
- Structural Similarity (SSIM) Index for Video Quality Assessment
- Reducing the HEVC/H.265 Encoding Complexity using Image Processing Techniques
- HEVC Encoding and Decoding using Many-core Architectures
- Performance and Power Optimization of Video Playback on Desktop and Mobile

More information: http://www.aes.tu-berlin.de/menue/theses_projects/

Contact Person: [Sergio Sanz \(sergio.sanz@aes.tu-berlin.de\)](mailto:sergio.sanz@aes.tu-berlin.de)

Perceptual Encoding Optimization for 4K/8K Videos

- **Objective:** Improve the visual quality in compressed 4K/8K videos
- **General tasks**
 - Detect areas in the picture that are more perceptually sensitive to distortion (object boundaries, smooth gradient) by using image processing techniques
 - Give more bits to those areas
- **Required skills:** C/C++, MATLAB (or similar) programming
- **Desired skills:** Image processing and/or video coding background

Structural Similarity (SSIM) Index for Video Quality Assessment

- **Objective:** Implement and evaluate the SSIM index for measuring the quality of compressed video sequences
- **General tasks**
 - Study and implementation of the SSIM index
 - Configuration of its parameters for video coding
- **Required skills:** C/C++, MATLAB (or similar) programming
- **Desired skills:** Image processing and/or video coding background
- **Reference:** <https://ece.uwaterloo.ca/~z70wang/research/ssim/>

Reducing the HEVC/H.265 Encoding Complexity using Image Processing Techniques

- **Objective:** In HEVC/H.265 encoding the picture is split into blocks of smaller sizes according to the signal properties of every region for subsequent block-wise compression. Instead of testing all the splitting options, this thesis relies on pre-analyzing the picture for making fast block partitioning decisions
- **General tasks**
 - Study of the state of the art in fast block partition algorithms for HEVC
 - Implement and evaluate a state-of-the-art solution
- **Required skills:** C/C++, MATLAB (or similar) programming
- **Desired skills:** Image processing and/or video coding background

HEVC Encoding and Decoding using Many-core architectures

- **Objective:** Port and optimize HEVC codec for many-core architectures such as Intel Xeon-Phi, and Kalray MPPA
- **General tasks**
 - Characterize architectures using microbenchmarking
 - Implement and evaluate new parallelization strategies
- **Required skills:** C/C++ programming, parallel computing
- **Desired skills:** Experience with performance analysis and profiling tools

Performance and Power Optimization of Video Playback on Desktop and Mobile

■ **Objective:** Analyze and improve the performance and power efficiency of video decoding and rendering on desktop and mobile platforms. Video playback includes HEVC decoding and rendering, integrated into multimedia frameworks such as Gstreamer (Linux), and Stagefright (Android)

■ General tasks

- Port HEVC decoding to mobile media frameworks
- Analyze performance and power of video decoding and rendering

■ **Required skills:** C/C++ programming, mobile development

■ **Desired skills:** Media framework background

■ **Reference:** <https://source.android.com/devices/media/index.html>

