Doctoraat van Shahid Satti met als titel: "Scalable Single and Multiple Description Scalar Quantization"
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Thesis Abstract:
Scalable representation of a source (e.g., image/video/3D-mesh) enables decoding of the encoded bit-stream on a variety of end-user terminals with varying display, storage and processing capabilities. Furthermore, it allows for source communication via channels with different transmission bandwidths, as the source rate can be easily adapted to match the available channel bandwidth. From a different perspective, error-resilience against channel losses is also very important when transmitting scalable source streams over lossy transmission channels. Driven by the aforementioned requirements of scalable representation and error-resilience, this dissertation focuses on the analysis and design of scalable single and multiple description scalar quantizers.
In the first part of this dissertation, we consider the design of scalable wavelet-based semi-regular 3D-mesh compression systems. In this sense, our design methodology thoroughly analyzes different modules of the coding system in order to single-out appropriate design choices. Based on our analysis, we propose novel intraband and composite mesh codecs which exhibit superior compression performance when compared to the existing state-of-the-art methods. Furthermore, in contrast to the existing methods, the proposed codecs enable the quality as well as the resolution scalability of the compressed mesh.
The second part of the dissertation relates to the design of scalable multiple description quantizers in order to provide source scalability and error-resilience in a unified coding framework. In this context, a generic symmetric scalable multiple description quantizer is proposed which generates perfectly balanced source descriptions. Moreover, an innovative extension of the Lloyd-Max algorithm is introduced in order to optimize scalable multiple description quantizers. Experimental evaluations for generalized Gaussian and image sources confirm that, compared to the contemporary schemes, the designed quantizer constructions account for a significant average gain in signal-to-noise-ratio for a wide range of packet loss rates.