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Title:	**SVC Core Experiment 2.4: Adaptive spatial transforms**
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The responses to the *Call for Proposals on Scalable Video Coding Technology* (N6193) documented in [1] proved the existence of techniques that exhibit promising coding efficiency combined with functionalities of temporal, spatial, and SNR scalability. A class of proposals are based on the state-of-the-art AVC video coding standard [2]. One of the proposals that showed a coding efficiency nearly comparable to AVC represents an MCTF extension of AVC [3].

For the *Fidelity Range Extensions* (FRExt) of AVC the concept of adaptive block transforms has been recently adopted (cp. [4]). The transform size as well as the size of the spatial intra predictors (4x4 or 8x8) for the luminance component can be adaptively chosen on macroblock basis, with the exception of inter-coded macroblocks for which block sizes smaller than 8x8 are used for motion-compensated prediction. For the AVC standard, it was reported that the concept of adaptive block transforms improves the coding efficiency objectively (PSNR) and subjectively.

The goal of this core experiment is to evaluate, whether the incorporation of the concept of adaptive block transforms can also improve the coding efficiency of the AVC-based MCTF approach.

Core Experiment Specification

The core experiment has been performed using a modified version of the software of the Fraunhofer Institute for Telecommunications – Heinrich Hertz Institute. The inter-layer prediction of motion and residual data that is presented in [6] was already included in this software version.
The following two versions of the AVC-based MCTF approach have been compared for the core experiment:

- ***CE2.4_verA***: This version is identical to the version *CE2.1_verB* used in the core experiment 2.1 [6]. It includes the inter-layer prediction of motion and residual data. In this version of the AVC-based MCTF codec, only the standard 4x4 block transform

and intra prediction modes are used for coding the residual (high-pass) blocks as well as the intra (low-pass) blocks.

- ***CE2.4_verB***: In this version, the concept of adaptive block transforms is incorporated. For each macroblock (with exception of macroblocks for which block sizes smaller than 8x8 are used for motion-compensated prediction), the transform size (4x4 and 8x8) can be adaptively chosen for the luminance component. The adaptive block transform has been implemented in accordance with the *Fidelity Range Extensions* of AVC. All remaining parts of the codec are identical to version *CE2.4_verA*.

Core Experiment Results

The results of the core experiment for the sequences and test conditions specified in the *Core Experiment Description* [5] are summarized in the accompanying Excel document. For evaluating the quality of the reconstructed sequences, we used the average PSNR of the luminance component as well as subjective tests. The PSNR values have been calculated with respect to the original sequences provided with the *Call for Proposals on Scalable Video Coding Technology* as it is specified in [5] for the Core Experiments on AVC-based scalable video coding.

The rate-distortion curves that are contained in the accompanying Excel document show that by using the concept of adaptive block transforms, the objective quality (PSNR) can be improved for nearly all test sequences. PSNR gains between 0 and 0.4 dB have been observed.

Our subjective evaluation of the reconstructed sequences turned out that the subjective quality was also improved by employing the concept of adaptive block transforms; especially, spatial details are better preserved.

References

[1] MPEG Video Subgroup Chair, "Registered Responses to the Call of Proposals on Scalable Video Coding," ISO/IEC JTC1/SC29/WG11/M10569.

[2] ITU-T and ISO/IEC JTC1, "Advanced Video Coding for Generic Audiovisual Services," ITU-T Recommendation H.264 – ISO/IEC 14496-10 AVC, 2003.

[3] H. Schwarz, D. Marpe, and T. Wiegand, "Scalable Extension of H.264/AVC," ISO/IEC JCT1/SC29/WG11/M10596/S03.

[4] T. Wiegand, ed., "Version 3 of H.264/AVC," JVT-L012d2.

[5] M. van der Schaar, M. Domanski, "Description of Core Experiments in MPEG-21 Scalable Video Coding," ISO/IEC JTC1/SC29/WG11/N6373.

[6] H. Schwarz, D. Marpe, and T. Wiegand, "SVC Core Experiment 2.1: Inter-layer prediction of motion and residual data," ISO/IEC JTC1/WG11/M11043.