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Novel HEVC Parallel Processing Method for Asymmetric Multicores Based on the Prediction Complexity

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Abstract. Recently, ultra-high definition (UHD) video services are emerging. Due to the resolution of UHD video (4K, 8K) is from 4 to 16 times of full-high definition (FHD) video, the parallel processing to support real-time requirements become very important.

The tile is a new parallel processing tool for high efficiency video coding (HEVC) standard, and it is appropriate for the UHD video. However, it does not consider the computational ability of big/LITTLE asymmetric cores and allocates video tiles to the cores equally, which causes video processing (encoding/decoding) delays.

To solve the problem, this paper suggests a novel tile allocation method considering the computational ability of asymmetric multicores as well as the computational complexity of each tile. The computational ability of asymmetric multicores can be measured or provided by chip maker, and the computational complexity of each tile can be measured the amount of HEVC prediction unit (PU) partitioning.

The implemented system (1) counts and sorts the amount of PU partitioning of each tile and (2) allocates tiles to asymmetric big/LITTLE cores according to their expecting computational complexity. 4K PeopleOnStreet test sequence, thee coding structures such as random access (RA), all intra (AI), and low-delay B (LDB) defined in the common test condition (CTC) of HEVC standard, and 6 multicores consists of 2 big cores and 4 little cores were used for experiments.

When experiments were conducted, the amount of PU partitioning and the computational complexity (decoding time) show a close correlation, and average performance gains of decoding time were 5.24% for 6 tiles and 8.44% for 12 tiles, respectively.

Keywords: HEVC, Parallel video processing, Asymmetric multicores, Tiles

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Novel Video Streaming System for Three-Screen TV

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Abstract. This paper describes the design and implementation of a multimedia home gateway for three-screen television (3STV) service. The proposed in-home wireless network uses scalable video coding (SVC) and unequal error protection with Raptor forward error correction (FEC) for maximizing the quality of experience (QoE) over the variable-bandwidth, error-prone wireless network.

The gateway incorporates (a) dynamic SVC layer-switching, which enables the server to perform selecting appropriate layers from SVC bitstreams, (b) adaptive Raptor FEC, which controls the overhead of Raptor FEC according to packet loss rate (PLR), (c) an efficient combination of (a) and (b), and (d) slice group-based selective streaming in the overall gateway architecture. The paper explains the home gateway architecture as well as experiments for performance evaluation as compared to that of traditional SVC streaming.

By implementing the above methods, this study demonstrated the real-time home gateway system including video streaming server and a real-time SVC player. In the experiments conducted, gains in video quality vary from 2 to 5 dB in peak signal-to-noise ratio (PSNR), with corresponding subjective improvements. Overall reductions of bit rate at the input to the home gateway vary from 28% to 36%.

Keywords: SVC, Raptor FEC, Layer-switching, Home gateway, Three-screen TV