Hierarchical-and-Adaptive Bit-allocation with Selective Background Prediction for High Efficiency Video Coding (HEVC)

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Recently, a low-delay and high-efficiency hierarchical prediction structure (HPS) [1] has been proposed for the forthcoming HEVC. Actually, frames and coding units (CUs) at different HPS positions have different importance to predict following frames and CUs.

In frame level, if there is a global background, the background should be a More Important Frame (MIF) to long-termly predict following frames and the following MIFs should just be chosen periodically. Otherwise, the MIFs should be the frames similar with neighboring frames. Secondly in CU level, some CUs usually have no similar data in the previous MIFs. We denote these CUs as More Important CUs (MICs) and MICs should be quantified with smaller QPs, i.e., frame QP minus 1.

Based on the analysis, we propose a Hierarchical-and-Adaptive BIT-allocation method with Selective background prediction (*HABITS*) to optimize the video performance of HEVC. Then *HABITS* detects whether a modeled background exists through running-average based background modeling. If there is, result of background encoding and decoding will used as a long-term reference for following frames. Afterwards, MIFs and MICs are separately selected as the analysis says. Frame-level quantization procedure is shown in Fig. 1. As is seen, groups of pictures (GOPs) are quantified differently according to whether a global background exists and whether a GOP has an MIF.

Experiments results on HM8.0 are shown in Table 1. *HABITS* can achieve 13.3% and 35.5% bit-saving for eight HEVC conference videos and eight common used surveillance videos. Even for the normal videos in Class B and C, there is still 2.2% bit-saving.

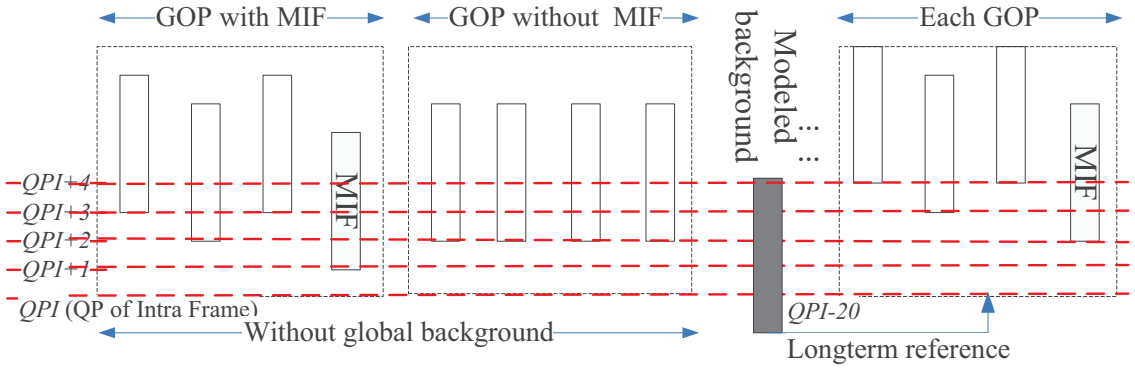

Fig.1 Hierarchical-and-Adaptive quantization

Table 1. Experimental results

Conference Videos in Class D		Surveillance Videos		Normal Videos in Class B&C	
BD rate	Time	BD rate	Time	BD rate	Time
-13.3%	-4.9%	-35.5%	-12.4%	-2.2%	-6.5%

Reference

[1] Jizheng Xu, Feng Wu and Houqiang Li, "Encoding optimization to improve coding efficiency for low delay cases," JCTVC-F701r1.doc, Jul. 2011.

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