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CODING EFFICIENCY IMPROVEMENT WITH ADAPTIVE GOP SELECTION FOR H.264/SVC

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Abstract. *In this paper, we present a novel group-of-picture (GOP) structure selection method for H.264/SVC. Proposed method adaptively defines the GOP structure by analyzing the input sequence characters. The accumulated difference of luminance pixel components is utilized to set a threshold for adaptive GOP size selection. Another scene change detection method is also proposed to reorganize the GOP structure. Different from previous adaptive GOP structure methods, the proposed method concentrates on the coding efficiency improvement on the basis of the Hierarchical B-picture structure. The simulation results show that the proposed method can improve up to 0.2dB for PSNR compared with fixed size GOP methods.*
Keywords: H.264/SVC, Scalable video coding, Hierarchical B-picture, GOP structure

1. **Introduction.** With the recent growth of internet and communication applications, the development of the video communication becomes more and more important. However, in many cases the same video contents have to be provided to different end-terminals over various transmission channels at the same time. Either the transmission channels or the end-terminals have to be designed to adapt to multiple encoded versions. Therefore, scalable video coding (SVC) has been a challenging research topic in recent years. H.264/SVC is a scalable video coding extension of H.264/AVC [1][2][3]. It extends the capabilities of the H.264/AVC to address the needs of applications to make flexible video coding in highly heterogeneous and time-varying environments. Different from multiple description coding (MDC) which encodes the image into several bitstream [4], the basic concept of H.264/SVC is to enable the generation of a unique bitstream that can adapt to various bitrate, transmission channel and display capabilities. Based on the target applications several reconstructed bitstreams can be generated in terms of spatial resolution, temporal frame rate and reconstruction accuracy [5]. A typical encoder structure with two spatial layers of H.264/SVC can be described as Figure 1.

As Figure 1 shows, H.264/SVC bitstream is represented by one base layer and one enhancement layer. The temporal resolution, the spatial resolution or the quality resolution scalability can be realized by simply attaching appropriate enhancement layers to the base layer which is decodable by a traditional H.264/AVC decoder.

For temporal scalability control of H.264/SVC, it is simply realized by frame-rate adaptation. Two emerging scalability control algorithms are proposed for temporal scalability control: motion-compensated temporal filtering (MCTF) and Hierarchical B-picture [6][7]. The comparison of these two methods are concluded in a previous work [8]. In both of the proposed methods, the adaptive GOP structure (AGS) is considered as an efficient method to improve the coding efficiency. In the latest working draft of H.264/SVC until