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Performance Evaluation of Frame Loss Error Concealment Solutions for SHVC standard

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***Abstract*:** Scalable High Efficiency Video Coding (SHVC) has been emerging as one of the efficient video coding solutions for adaptive video streaming and conferencing. SHVC is designed with a layered coding structure in which the High Efficiency Video Coding (HEVC) tools are employed as core elements. However, the compression efficiency and the error sensitivity associated to efficient HEVC tools make this scalable codec less attractive to practical video transmission, especially when the loss of packets or video frames occurs. This problem introduces severe impacts to the displayed quality of received video. To address this problem, we propose efficient error concealment (EC) methods that conceal the whole frame lost and mitigate the error propagation problem occurred in practical video transmission using SHVC. The presented EC methods mainly rely on the decoded information; thus, it is easy to be integrated into the SHVC decoder as a post-processing component. The experimental results obtained for both subjective and objective quality assessments shown that, the inter-layer correlation based EC approach typically provides the highest concealed frame quality; thus, it is highly recommended for practical video transmission.

***Keywords*:** Scalable Video Coding, SHVC standard, error concealment, frame loss, error propagation

1. Introduction

With the explosion of real-time multimedia applications, especially in live streaming and conferencing videos, it is necessary to find an effective way to deliver video contents. Considering different client environments, content providers should generate an optimal bitstream to provide best experience to end users. To fulfill this requirement, scalable extension (SHVC) [1] of the High Efficiency Video Coding standard (HEVC) [2] was standardized in 2014. As reported, SHVC can yield a multi-decodable bitstream while achieving a significant compression gain compared to the prior SVC standard [3].

For the most modern video coding standards, e.g., H.264/AVC and HEVC, a video frame is typically compressed in one or several slices [2-4]. Each encoded slice is then encapsulated into a packet. Therefore, the loss of a packet will result in the loss of a whole slice. If a frame contains only one slice, the whole frame loss will happen. This severely degrades the quality of the displayed video. Figure 1 shows an example of a practical video transmission in which frame 1 is received correctly but frame number 2 is lost. In this example, not only the frame 2 is unable to display but also the quality of the successive frames, 3 and 4, which requires frame 2 for prediction are also degraded.

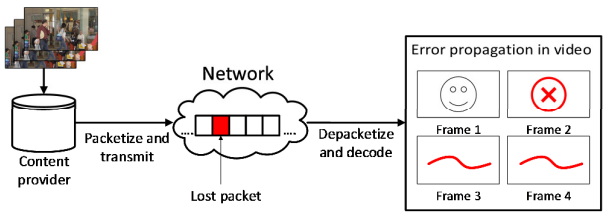

Figure 1. Example of the whole frame loss happened in practical video transmissions.