Base Layer Constrained Error Concealment Solutions for Robust SHVC Video Transmission

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***Abstract*—Considering for a powerful scalable video coding solution, not only in error-free but also in error-prone environment, this paper proposes two error concealment (EC) solutions, which mainly rely on the base layer available information. The proposed error concealment solutions are integrated at the decoder side of the most recent scalable high efficiency video coding (SHVC) standard. The proposed EC solutions are adaptively performed with the coding structure of the SHVC standard, notably the quad-tree division and the high-level syntax approach. Experiments conducted for a rich set of test sequences and conditions have shown the advances of the proposed EC concealments, notably with around 4 dB concealed frame quality improvement when compared to the conventional frame copy approach.**

Keywords*—*SHVC standard, error concealment, frame loss, high-level syntax

I. Introduction

Our recent works [1] have shown a significant compression gain can be achieved for SHVC standard [2] with a joint layer data exploitation. However, the proposed SHVC scheme is typically considered for error-free transmission environment. When the data congestion happens, the frame loss may severely damage the quality of reconstructed frames, especially in the enhancement layers. Therefore, our goal in this paper is to design efficient error concealment solutions for SHVC enhancement layers by considering the available information extracted from mainly the base layer.

II. Proposed Error Concealment Solutions and Results

To the best of our knowledge, there were not many efforts on studying the whole frame loss concealment for SHVC standard. The SHVC reference software, namely SHM, is only capable of detecting frame loss and conceals this frame by simply copying the texture information from its closet reference frame in the same layer. This frame copy (FC) solution, however, is only suitable for a single layer compression scenario. In case of SHVC with multiple layers, the available information from the lower layers, i.e., base layer should be employed. Hence, our EC proposals, base layer constrained texture copying (BLTC) and base layer constrained motion vector derivation (BLMVD) are integrated into the SHVC decoder side, to exploit the available information from base layer, i.e., texture and motion vector as shown in Fig. 1. For both solutions, the quad-tree structure and high-level syntax elements adopted in SHVC standard are adaptively used to further improve the concealed frame quality.

Experimental results shown in Fig. 2, for *BQMall* sequence proved the efficiency of the proposed EC solutions, notably by improving the quality of enhancement layer decoded frames.

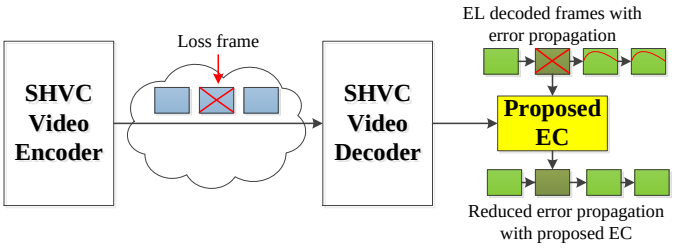

Fig. 1. Conceptual diagram of SHVC with proposed EC solution

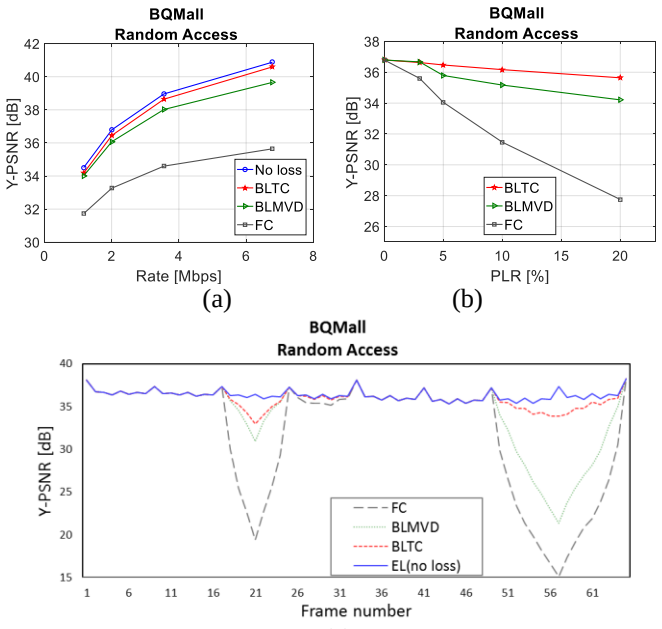

Fig. 2. Decoded frame quality improvments with the proposed EC solutions: a) RD performance comparison; b) decoded frame quality asessment with packet lot rates (PLR); c) decoded frame quality assessment along sequence

References

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