

## AN ERROR RESILIENT TECHNIQUE USING REVERSIBLE DATA EMBEDDING IN H.264/AVC

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Received January 2010; revised June 2010

**ABSTRACT.** *An Error Resilient technique using reversible data embedding in H.264/AVC aiming at high quality recovery under high loss rate is proposed. For compressed videos, predictive coding techniques increase the dependency between frames. When error occurs, it may propagate to other frames. In H.264/AVC, in order to achieve higher compression ratio, it adopted intra prediction to further compress intra frames. Such technique also results in error propagation in intra frames. This paper proposes a new error resilient technique using reversible data embedding in H.264/AVC. The use of reversible data embedding technique is to provide better restoration. Simulation results demonstrate the proposed scheme outperforms current existing techniques on robustness and recovery quality.*

**Keywords:** Error resilience, Error concealment, H.264/AVC, Reversible data embedding, Sub-sampling

1. **Introduction.** For predictive coding techniques, errors occurred in one packet will propagate to the successive coding and neighboring regions. This is because of the very nature of predictive coding. H.264/AVC [1] is the latest international video coding standard of the ITU-T Video Coding Experts Group and the ISO/IEC Moving Picture Experts Group. The new standard adopts many predictive coding concepts to improve the coding efficiency of intra and inter frames. Some techniques increase the dependency of the neighboring frames in a GOP (Group of Pictures), while others increase the dependency of the neighboring macro-blocks in an intra frame. In an intra frame, when one slice encounters a transmission error, not only the successive inter coding which reference this slice but also neighboring slices in the same intra frame will be affected. The affected areas will increase as the error propagates. Therefore, the integrity of intra frame is essential. Error concealment techniques and error resilient encoding techniques are then developed to solve the problem.

Error concealment techniques [2-5] are implemented on the decoder. They use temporal and/or spatial information to recover lost blocks or motion vectors without changing the original coded bit stream. Error resilient encoding techniques [6-9] are implemented on both encoder and decoder. On the encoder side, they first extract important information from the original video and then embed it back to the video during encoding process. On the decoder side, when a transmission error occurs, the decoder extracts embedded important information to recover the lost block and/or motion vector.

Data embedding is an important technique in the research of error resilience. This technique is also used in digital watermarking [10-16] for copyright protection and authentication. Traditional data embedding techniques are destructive to the original image