Multiple Description Video Coding Using Macro Block Level Correlation of Inter-/Intra-Descriptions

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Multiple description coding (MDC) is a promising technology for robust transmission over error-prone channels, which has attracted a lot research interests. The basic idea of MDC is to how to utilize redundant information of the descriptions for robust transmission. In view of practical applications, many MDC approaches have been proposed compatible with a certain standard codec, especially H.264/AVC. In this paper, we attempt to develop a novel MD video codec with generalized compatibility, which aims to the effective redundancy allocation from inter-/intra-descriptions. In [1], the redundancy allocation may be not enough effective due to frame level. As a result, in this paper, the redundant information will be taken into account at MB level.

For simplicity, the original video sequence can be split into odd and even frames firstly, which is fully compatible with the current standard video codec, such as H.26x and MPEG series. Then the correlation of inter-description at macro block (MB) level is applied to produce side information of three different modes which is helpful for better side decoding quality. If the correlation is considered enough to normally yield good estimation for the lost MB in side reconstruction, no extra redundancy needs to be inserted (Mode 1). Otherwise the real motion vectors for this lost MB need to be transmitted (Mode 2), even the corresponding residuals are also needed (Mode 3). Furthermore, MB level correlation of intra-description is exploited to design the adaptive skip mode for higher compression efficiency. After such redundancy allocation each video sub-sequence can be encoded to bit streams using the current standard codec. In addition, the residuals generated in Mode 3 also can be compressed using intra-coding. If only one channel works the side decoder is designed to estimate the lost information according to the different modes. In the case of Mode 1, the lost frames can be reconstructed using the method of motion compensation interpolation (MCI) directly. In the case of Mode 2 and Mode 3, side information such as motion vectors and residuals can be applied to refine the reconstructed quality of MCI.

In the experimental results for the test video "Paris.cif" the proposed scheme outperforms the compared scheme [1] with both improvements of 0.5-1.7 dB in side distortion and 0.5-1 dB in central distortion at the same bit rate over a wide range from 400kbps to 1800kbps.

[1] H. Bai, Y. Zhao, C. Zhu, A. Wang, "Multiple description video coding using joint frame duplication/interpolation," Computing and Informatics, vol. 29, pp. 1267-1282, 2010.