

# A Study on Motion Prediction and Coding for In-Band Motion Compensated Temporal Filtering\*

Dongdong Zhang, Wenjun Zhang, Li Song, and Hongkai Xiong

The Institute of Image Communication & Information Processing, Shanghai Jiao Tong Univ., Haoran Hi-tech Building, No.1954 Huashan Road, Shanghai 200030, China  
{CESSY, zhangwenjun, songli, xionghongkai}@sjtu.edu.cn

**Abstract.** Compared with spatial domain motion compensated temporal filtering (MCTF) scheme, in-band MCTF scheme needs more coding bits for motion information since the motion estimation (ME) and motion compensation (MC) are implemented on each spatial subband. Therefore, how to employ motion prediction and coding is a key problem to improve the coding efficiency of in-band MCTF. In this paper, we proposed an efficient level-by-level mode-based motion prediction and coding scheme for in-band MCTF. In our scheme, three motion prediction and coding modes are introduced to exploit the subband motion correlation at different resolution as well as the spatial motion correlation in the high frequency subband. To tradeoff the complexity and the accuracy of block-based motion search, a jointly rate-distortion criterion is proposed to decide a set of optimized motion vector for three spatial high frequency subbands at the same level. By the rate-distortion optimized mode selection engine, the proposed scheme can improve the coding efficiency about 0.6db for 4CIF sequence.

## 1 Introduction

As many video communication applications take place in heterogeneous environment, the scalability of a video codec becomes an important feature besides coding efficiency. 3D Wavelet video coding provides an elegant solution for scalable video coding due to its multi-resolution nature. Of various 3D wavelet video coding schemes, most can be classified into two categories: spatial domain MCTF (SDMCTF) scheme [1], [6] and in-band MCTF (IBMCTF) scheme [3], [5]. The major difference between them is whether temporal transform is implemented before spatial decomposition or not.

Compared with SDMCTF scheme, IBMCTF scheme can achieve a competitive performance for lower resolution coding, while it suffers performance loss for higher resolution coding. There are two primary reasons for this: (1) the shift-variance of wavelet makes ME and MC with critical sampled wavelet coefficients not very efficient. (2). IBMCTF scheme needs more bits for coding motion information since

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