**Title:** Side information creation for efficient Wyner-Ziv video coding: Classifying and reviewing

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**Abstract:** Video coding technologies have played a major role in the explosion of large market digital video applications and services. In this context, the very popular MPEG-x and H-26x video coding standards adopted a predictive coding paradigm, where complex encoders exploit the data redundancy and irrelevancy to 'control' much simpler decoders. This codec paradigm fits well applications and services such as digital television and video storage where the decoder complexity is critical, but does not match well the requirements of emerging applications such as visual sensor networks where the encoder complexity is more critical. The Slepian Wolf and Wyner-Ziv theorems brought the possibility to develop the so-called Wyner-Ziv video codecs, following a different coding paradigm where it is the task of the decoder, and not anymore of the encoder, to (fully or partly) exploit the video redundancy. Theoretically, Wyner-Ziv video coding does not incur in any compression performance penalty regarding the more traditional predictive coding paradigm (at least for certain conditions). In the context of Wyner-Ziv video codecs, the so-called side information, which is a decoder estimate of the original frame to code, plays a critical role in the overall compression performance. For this reason, much research effort has been invested in the past decade to develop increasingly more efficient side information creation methods. This paper has the main objective to review and evaluate the available side information methods after proposing a classification taxonomy to guide this review, allowing to achieve more solid conclusions and better identify the next relevant research challenges. After classifying the side information creation methods into four classes, notably guess, try, hint and learn, the review of the most important techniques in each class and the evaluation of some of them leads to the important conclusion that the side information creation methods provide better rate-distortion (RD) performance depending on the amount of temporal correlation in each video sequence. It became also clear that the best available Wyner-Ziv video coding solutions are almost systematically based on the learn approach. The best solutions are already able to systematically outperform the H.264/AVC Intra, and also the H.264/AVC zero-motion standard solutions for specific types of content. (C) 2013 Elsevier B.V. All rights reserved.

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