Abstract

Distributed Video Coding (DVC) is a new coding paradigm based on two major Information Theory results: the Slepian-Wolf (1973) and Wyner-Ziv Theorems (1676). This new video coding paradigm allows exploiting the source statistic, partially or totally, at the decoder only. A particular case of distributed video coding is the Wyner-Ziv video coding. In this scenario, two correlated sources are independently encoded using separated encoders and the bitstreams associated to each source are jointly decoded exploiting the correlation between them.

Although the distributed coding study dates back to the 1970’s, efforts towards developing practical solutions of Wyner-Ziv video coding are more recent. Emerging applications (such as wireless, low-power surveillance systems and mobile camera phones among others) with encoding requirements quite different from those targeted by the MPEG-x and H.26x video coding standards have stimulated such efforts. In the MPEG-x and H.26x standards, the correlation between temporally adjacent frames is exploited through a complex motion estimation task which leads to a high complexity encoder. Since the correlation between temporally adjacent frames in Wyner-Ziv video coding is performed only at the decoder, the encoder can typically present a low complexity. Improved error resilience is another major functionality of this new video coding paradigm since the usual encoder prediction loop and the associated error propagation do not exist anymore.

The main objectives of the current Thesis are: 1) Perform a revision of the state-of-the-art on distributed video coding. 2) Develop and implement distributed video coding solutions for the pixel and the transform domains, notably frame interpolation techniques with motion compensation to improve the coding efficiency of the distributed video solutions developed.

**Keywords:** Distributed video coding, Wyner-Ziv, Slepian-Wolf, frame interpolation, channel codes, low encoding complexity, error resilience.



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