Distributed Image Coding with Unsupervised Learning

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Description

In distributed image compression, correlated images are separately encoded but jointly decoded. Theoretical results show that the performance limits of this approach are close to those of joint compression. Distributed compression is attractive for stereo image coding [1][2] (because it avoids the need for the encoders to communicate) and for low-complexity video encoding [3][4] (because it permits intraframe encoding and interframe decoding).

Since compression performance depends on exploiting the redundancy between images, knowing the disparity/motion field at the decoder is important. In distributed compression, the encoders cannot calculate and transmit the field. Instead, the decoder can perform unsupervised learning of disparity/motion via an iterative Expectation Maximization algorithm.

Topics

1. Low-complexity video encoding with unsupervised learning of motion

Students would implement a pixel-domain distributed video coder that learns frame to frame motion fields at the decoder, and compare it to a similar distributed video coder that doesn't learn motion [3][4]. The distributed stereo image coder would be provided as a starting point.

2. Distributed stereo image coding with object-level disparity learning

Students would extend the distributed stereo image coder with a soft-input soft-output object segmentation module. This would enable learning of disparity per object, instead of per block.

References

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[2] D. Varodayan, A. Mavlankar, M. Flierl and B. Girod, "Distributed grayscale stereo image coding with unsupervised learning of disparity," *Proc. IEEE Data Compression Conference, DCC 2007,* Snowbird, UT, March 2007.

[3] A. Aaron, R. Zhang and B. Girod, "Wyner-Ziv coding of motion video," *Proc. Asilomar Conference on Signals and Systems*, Pacific Grove, CA, Nov. 2002.

[4] A. Aaron, E. Setton and B. Girod, "Towards practical Wyner-Ziv coding of video", *Proc. IEEE International Conference on Image Processing*, *ICIP-2003,* Barcelona, Spain, Sept. 2003.