Wyner-Ziv Coding of Stereo Images with Unsupervised Learning of Disparity

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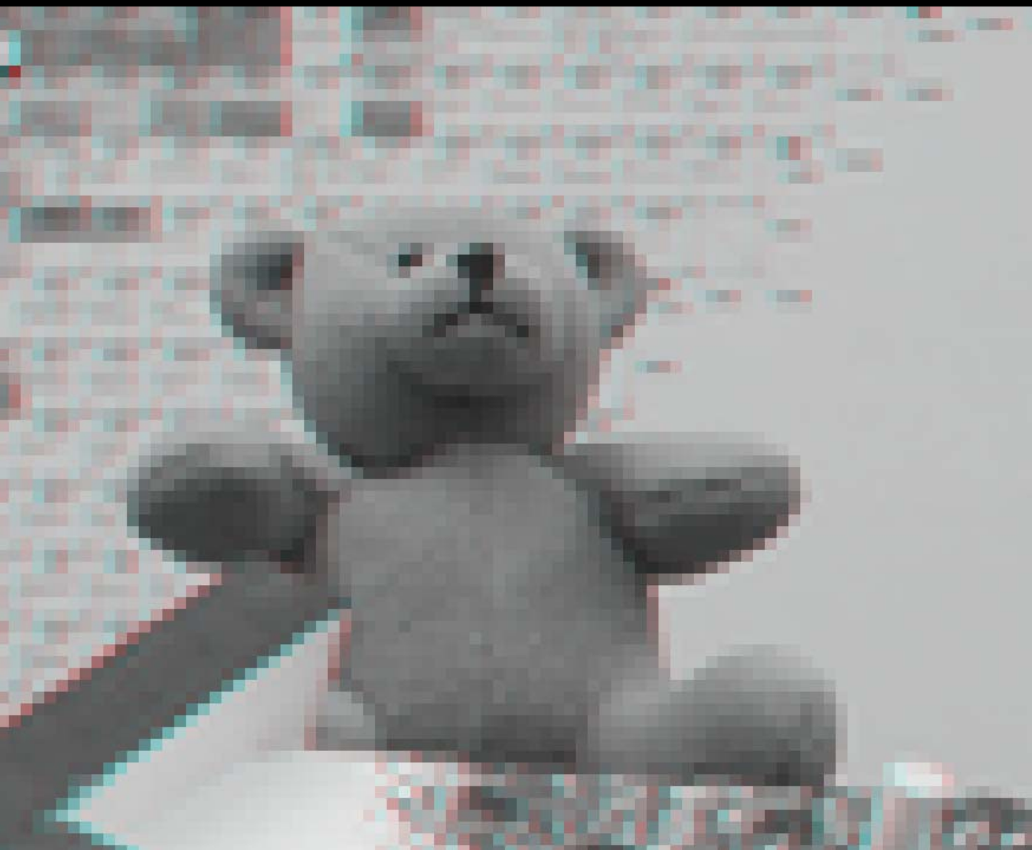
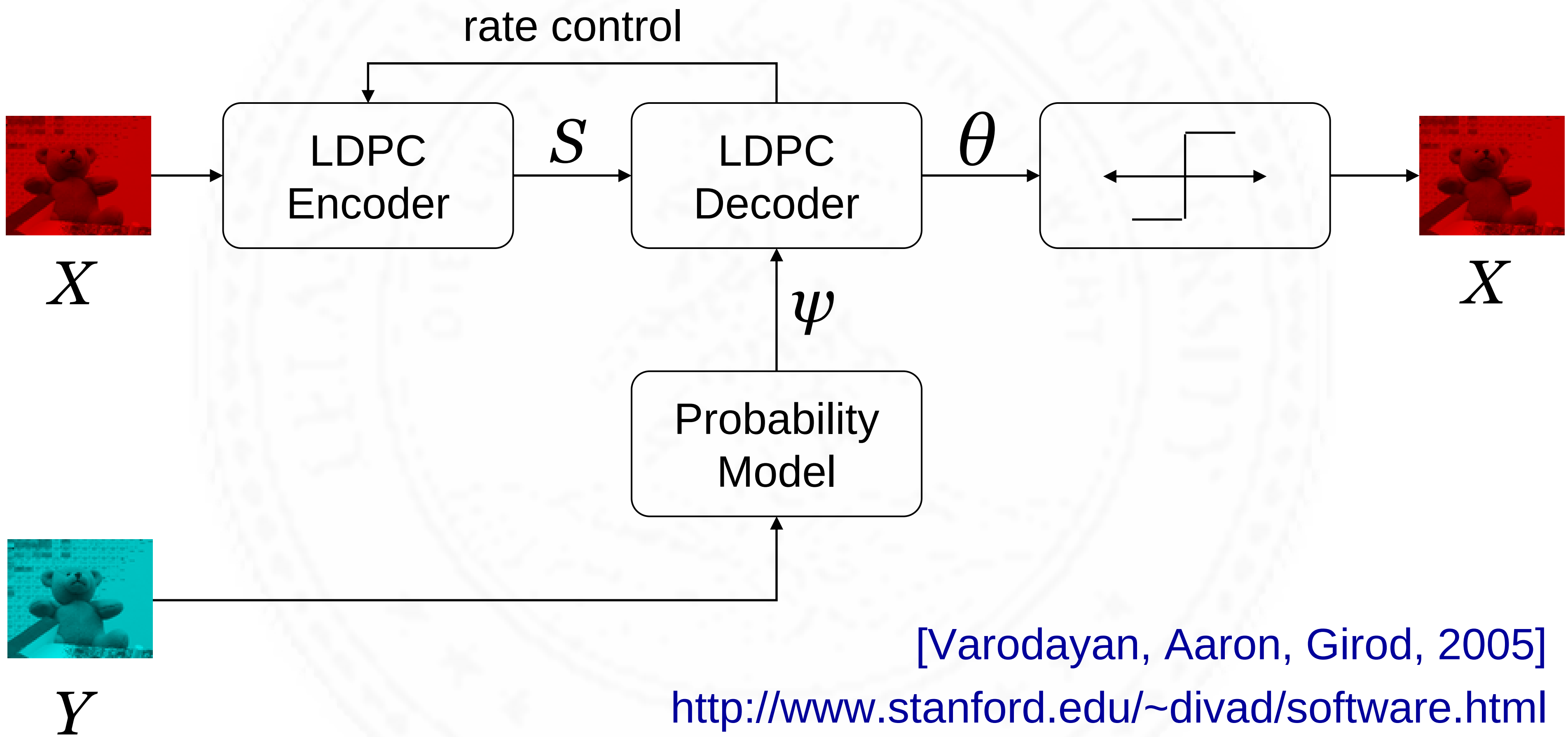



Outline

- Background on Slepian-Wolf coding with LDPC codes
- Stereo image coding with disparity oracle
- Stereo image coding with disparity learning
- Extension to Wyner-Ziv coding of stereo images
- Wyner-Ziv coding results

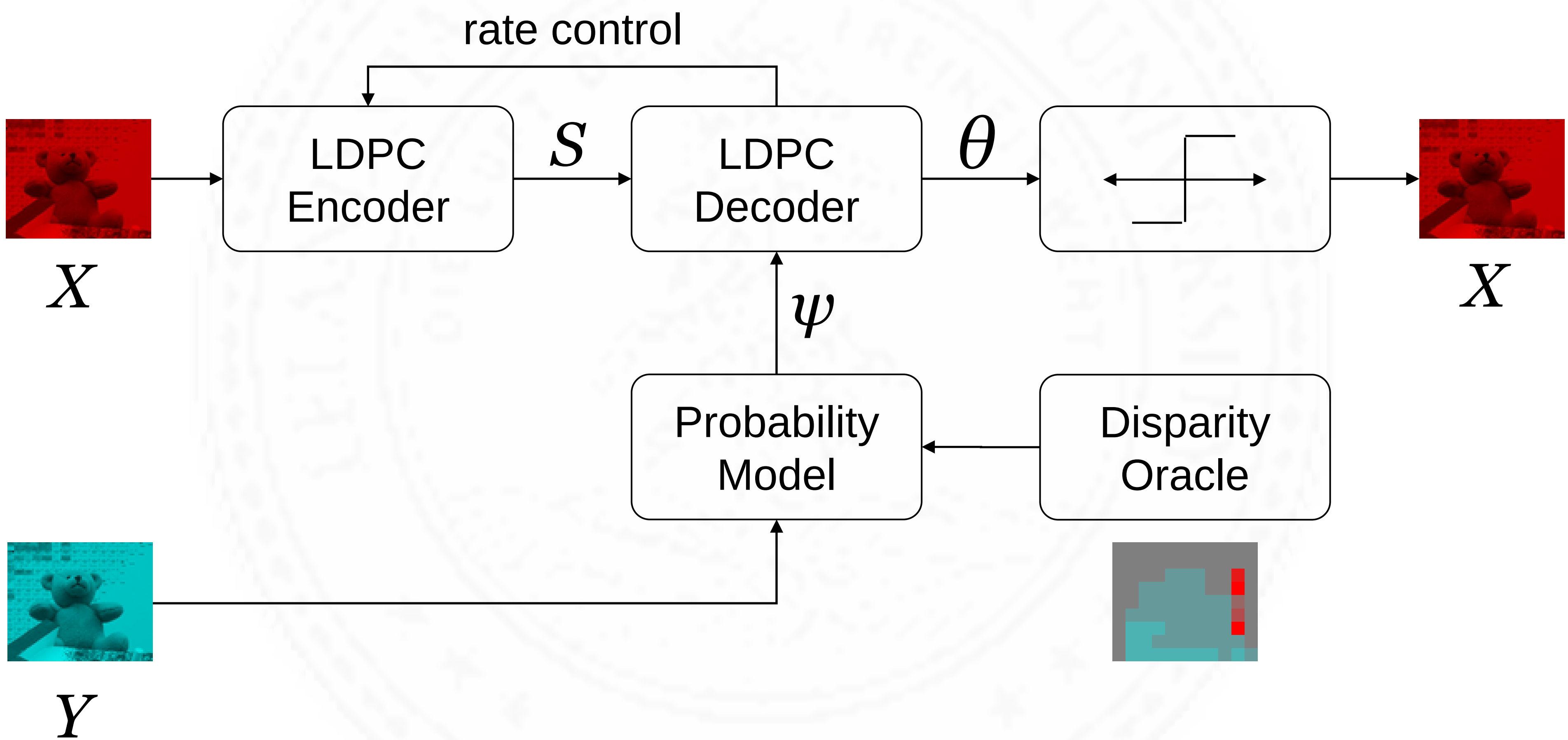
Slepian-Wolf Coding with LDPC Codes



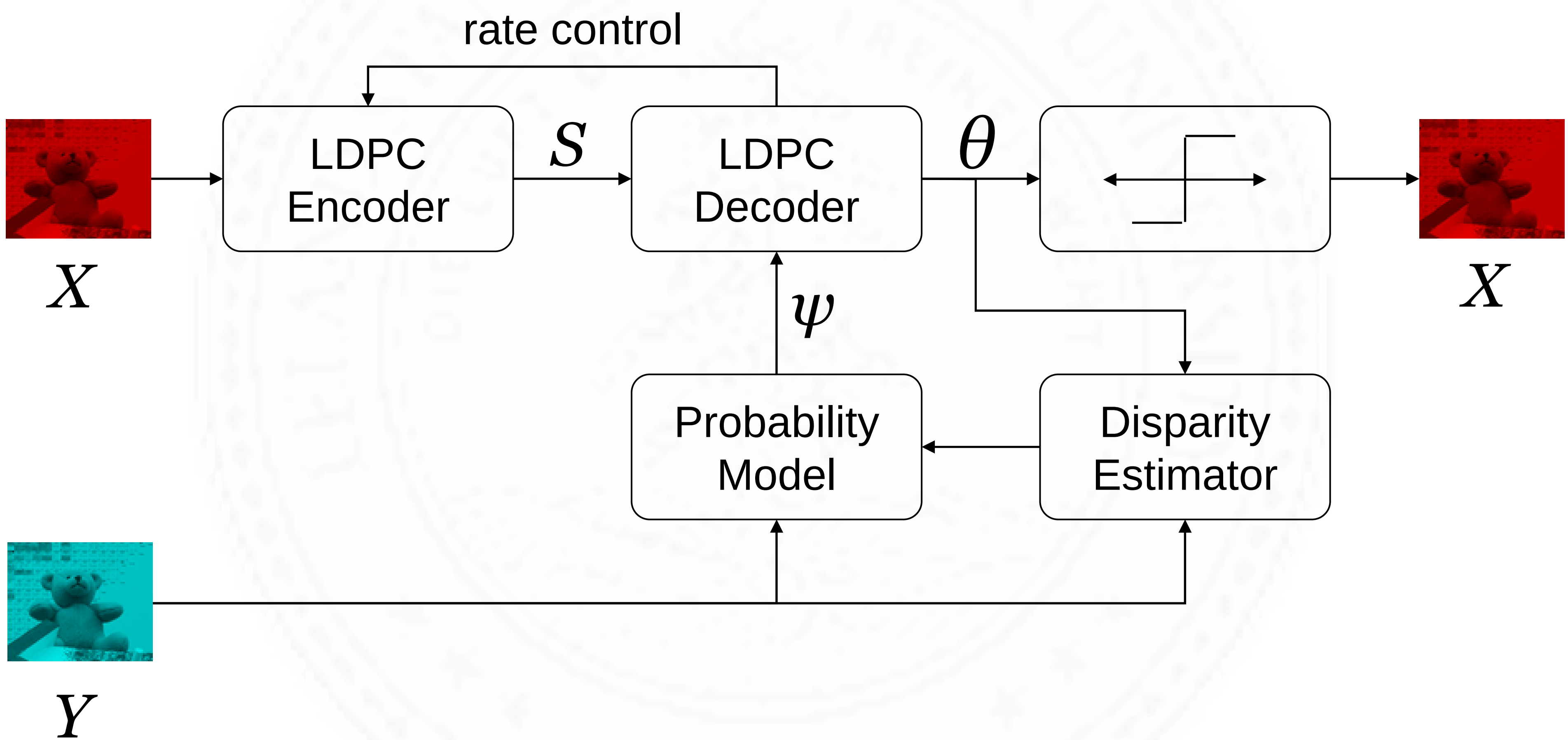
[Varodayan, Aaron, Girod, 2005]

http://www.stanford.edu/~divad/software.html

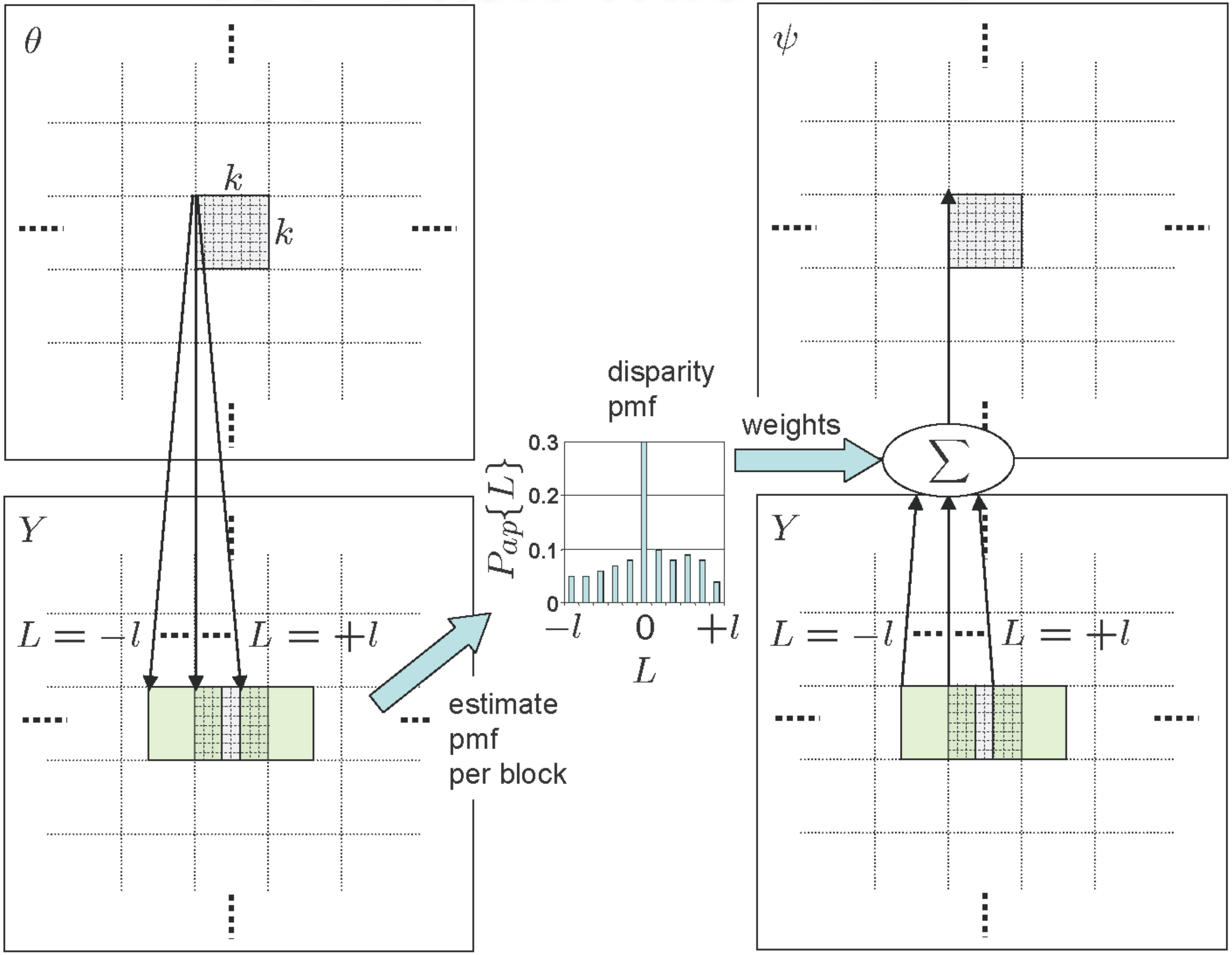
Oracle-Assisted Decoder



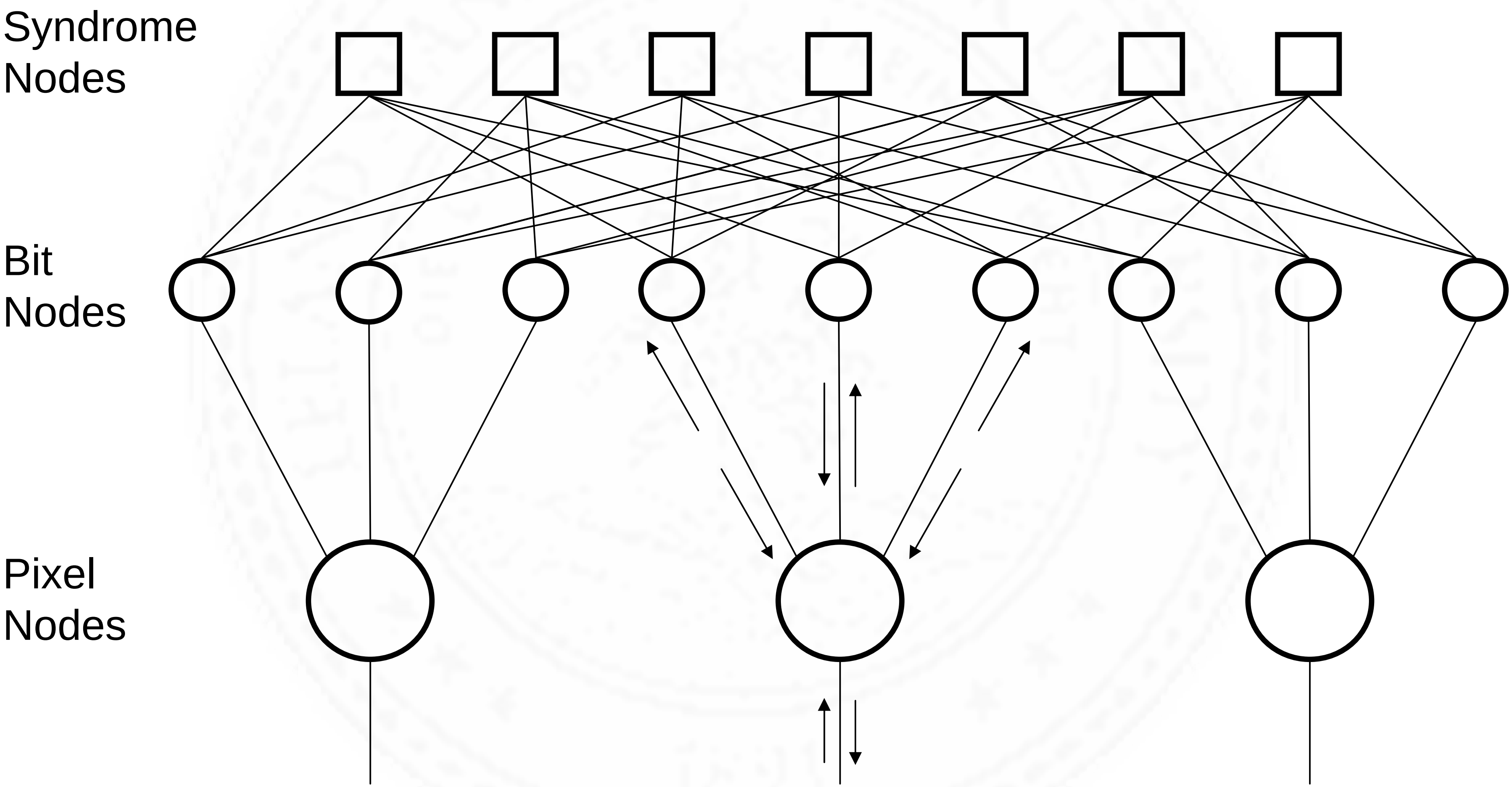
Unsupervised Disparity Learning at Decoder



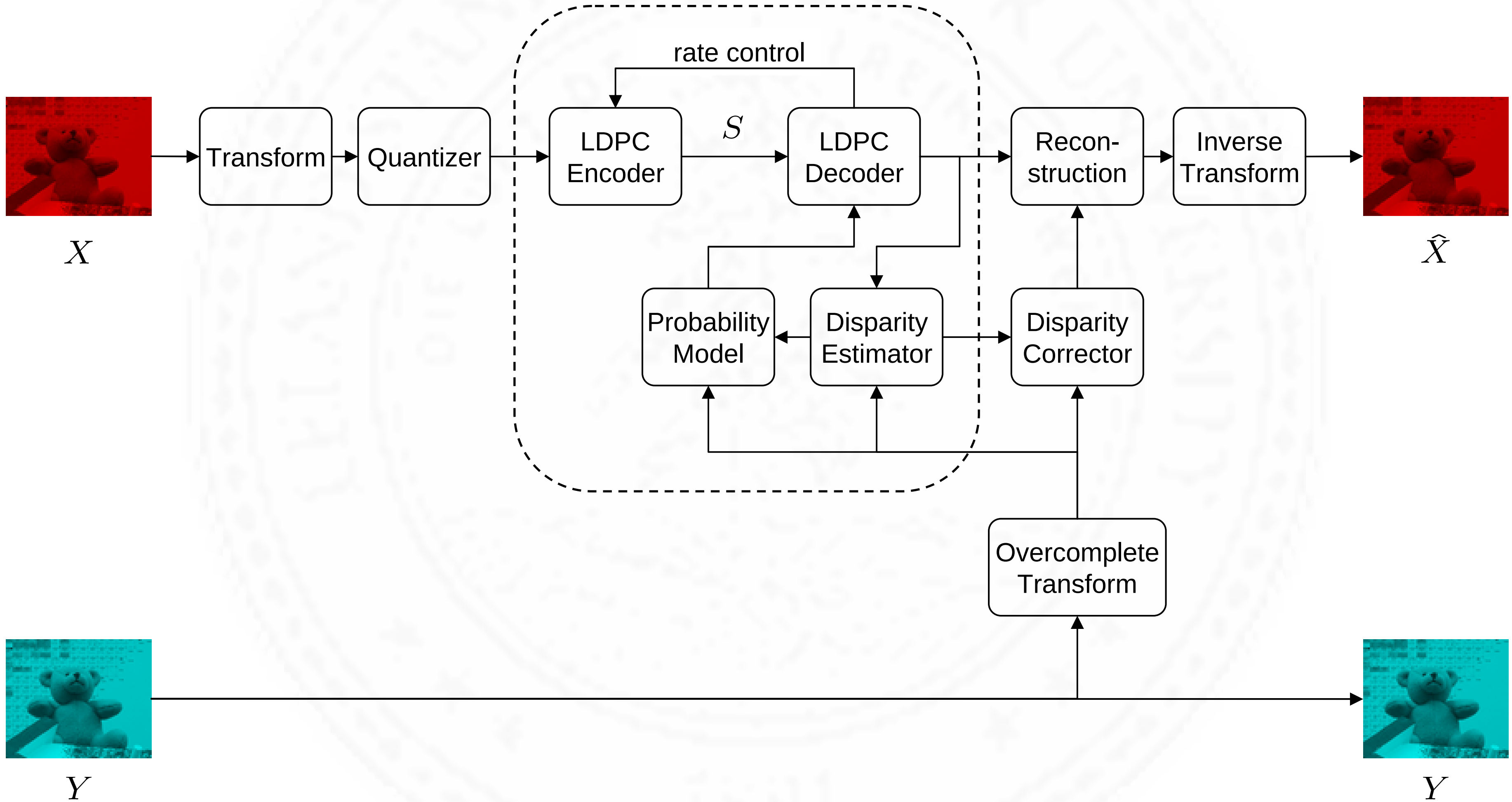
Disparity Estimation and Probability Modeling



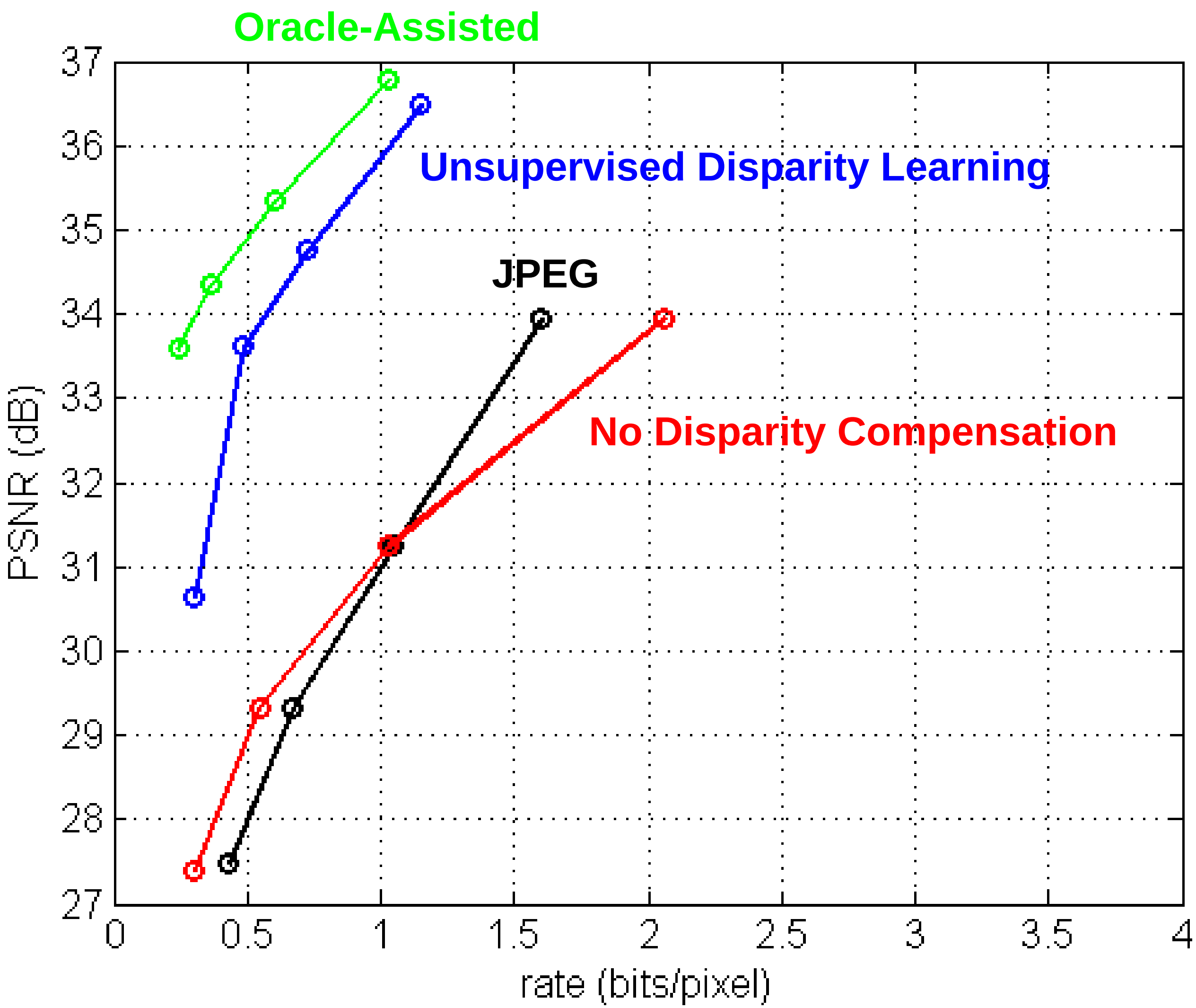
Joint Bitplane Decoding

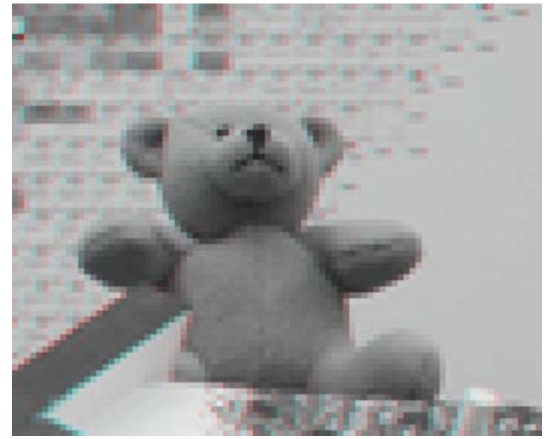


Extension to Wyner-Ziv Coding

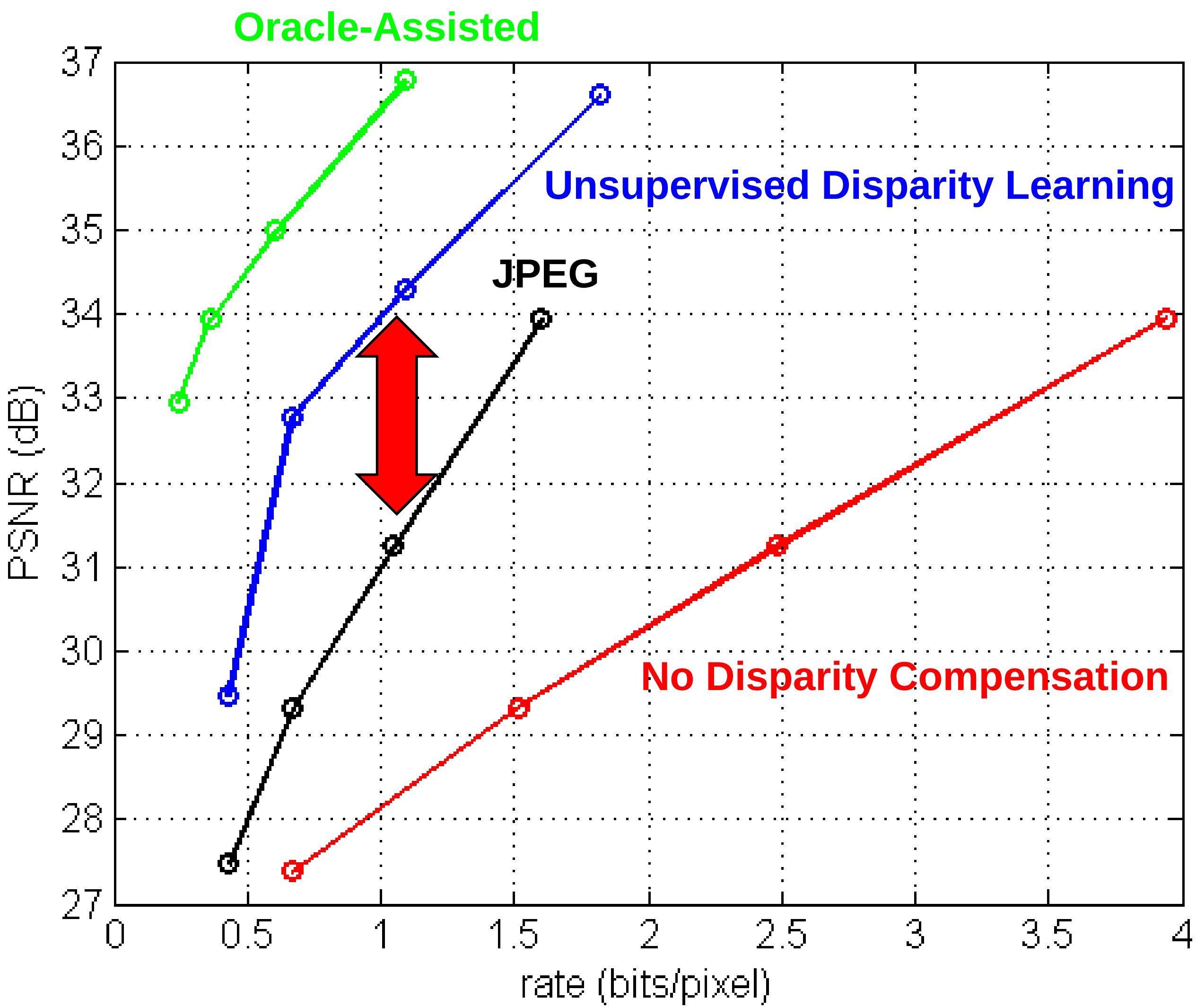


Wyner-Ziv Coding Results





Wyner-Ziv Coding Results



Unsupervised Disparity Learning
34.3 dB
1.09 bits/pixel

JPEG
31.3 dB
1.05 bits/pixel

Recap

- Novel Expectation-Maximization framework for joint decoding and disparity estimation of stereo images
  - Disparity estimation lies within LDPC decoding loop
  - Joint bitplane LDPC decoding enables disparity estimation at quantization coefficient level for stereo images

- Performance is superior to JPEG coding

Concluding Remarks

"Despite recent advances, distributed video coding rate-distortion performance is not yet at the level of predictive coding. The critical steps with respect to rate-distortion performance are:

1. *finding the best side information (or predictor) at the decoder and*
2. *accurately modeling and estimating the correlation channel."*

[Guillemot, Pereira, Torres, Ebrahimi, Leonardi, Ostermann, 2007]