TITLE: SYSTEMATIC LOSSY ERROR PROTECTION OF VIDEO SIGNALS

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SUMMARY:

Systematic Lossy Error Protection (SLEP) is a scheme for robust video transmission using distributed source coding ideas. In this scheme, a video signal is compressed conventionally and transmitted over an error-prone channel without channel coding. For robustness to channel errors, a separate bit stream, generated by Wyner-Ziv coding of the video signal, is sent to the receiver. In the event of channel errors, the Wyner-Ziv bit stream allows the decoding of a redundant description of the video signal which can be displayed in lieu of the portions lost from the primary, conventionally compressed video bit stream. Since the redundant description has, in general, inferior quality compared to the primary video, error protection is lossy. Therefore, while encoding the redundant description, care must be taken to ensure that the loss is imperceptible. In return for the loss in decoded picture quality, SLEP provides graceful quality degradation as the channel quality worsens, and provides stronger error protection compared to conventional Forward Error Correction (FEC) while introducing the same bit rate overhead.

The state-of-the-art in SLEP comprises an implementation based on the H.264/AVC video coding specification [1], end-to-end modeling and optimization of a SLEP system [2] and theoretical analysis of a simplified SLEP system using high-rate quantization theory [3].

In looking for new project ideas based on this work, the following questions may be posed:

1. Instead of a SLEP scheme using Reed-Solomon codes [1,2], are there advantages to using soft-decision decoding using an LDPC code applied directly to a coarsely quantized, but uncompressed, prediction error signal.
2. SLEP utilizes the services of an auxiliary Wyner-Ziv stream for error protection. Another application is to use a Wyner-Ziv bit stream in a layered video codec to generate the enhancement layer using the base layer as side information. In what other ways can an auxiliary Wyner-Ziv bit stream be put to use?

REFERENCES:

1. P. Baccichet, S. Rane**,** and B. Girod, *Systematic Lossy Error Protection based on H.264/AVC Redundant Slices and Flexible Macroblock Ordering*, Journal of Zheijang University, Science A, vol. 7, no. 5, pp. 727-736, May 2006.
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3. S. Rane, D. Rebollo-Monedero, B. Girod, *High-Rate Analysis of Systematic Lossy Error Protection of a Predictively Encoded Source*, Data Compression Conference (DCC 2007), Snowbird, Utah, March 2007.

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