Wyner-Ziv coding [1] is extended to the scenario of multivariate source and side information, whose rate-distortion function is obtained by a reverse water-filling method for the joint quadratic-Gaussian case.

**Theorem 1:** Let \( X^n = (X_1, X_2, \ldots, X_n) \), where \( X_i \sim N(0, \sigma^2_{X_i}) \), \( i \in N \) are independent Gaussian random variables. Let \( d(x^n, \hat{x}^n) = \sum_{i=1}^n (x_i - \hat{x}_i)^2 \) be the distortion measure. Let vector side information located at the decoder be denoted by \( S^n = (S_1, S_2, \ldots, S_n) \), \( S_i = X_i + N_i \), where \( N_i \sim N(0, \sigma^2_{N_i}) \), \( i = 1, 2, \ldots, n \) are independent of each other and of \( X^n \). Then the rate-distortion function is given by

\[
R^w(d) = \sum_{i=1}^n \frac{1}{2} \log \frac{\hat{\sigma}^2_i}{d_i}, \quad d_i = \min \{\lambda, \hat{\sigma}^2_i\}
\]

where \( \lambda \) is chosen so that \( \sum_{i=1}^n d_i = d \), \( \hat{\sigma}^2 \) \( = \sigma^2_{N_i} \cdot \sigma^2_{X_i} / (\sigma^2_{N_i} + \sigma^2_{X_i}) \).

The above theoretical prototype of multivariate Gaussian Wyner-Ziv coding is used to model the correlation between Distributed (D) frame and Side (S)frame in DVC [2]. Incorporating the Region-Division (Rd) ideas [3], based on DVC in pixel domain [2], the RdDVC scheme is developed accordingly. Modeled as Gaussian sources with different variances, the edge region and the background region are divided in D frame using the edge detection algorithm. Then, different quantizing and puncturing strategies are adopted in different regions.

**REFERENCES**

