

Design And Analysis Of Entropy-Constrained Reflected Residual Vector Quantization

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Summary

Residual vector quantization (RVQ) is a vector quantization (VQ) paradigm which imposes structural constraints on the encoder in order to reduce the encoding search burden and memory storage requirements of an unconstrained VQ. Jointly optimized RVQ (JORVQ) is an effective design algorithm for minimizing the overall quantization error. Reflected residual vector quantization (RRVQ) is an alternative design algorithm for the RVQ structure with a smaller computation burden. RRVQ works by imposing an additional symmetry constraint on the RVQ codebook design. Savings in computation were accompanied by an increase in distortion. However, an RRVQ codebook, being structured in nature, is expected to provide lower output entropy. Therefore, we generalize RRVQ to include noiseless entropy coding. The method is referred to as entropy-constrained RRVQ (EC-RRVQ). Simulation results show that EC-RRVQ outperforms RRVQ by 4 dB for memoryless Gaussian and Laplacian sources. In addition, for the same synthetic sources, EC-RRVQ provided an improvement over other entropy-constrained designs, such as entropy-constrained JORVQ (EC-JORVQ). The design performed equally well on image data. In comparison with EC-JORVQ, EC-RRVQ is simpler and outperforms the EC-JORVQ.

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