

Image Coding Using Entropy-Constrained Reflected Residual Vector Quantization

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Summary

Residual vector quantization (RVQ) is a structurally constrained vector quantization (VQ) paradigm. RVQ employs multipath search and has higher encoding cost as compared to sequential single-path search. Reflected residual vector quantization (Ref-RVQ), a design with additional symmetry on the codebook, was developed later to a jointly optimized RVQ structure with single-path search. The constrained Ref-RVQ codebook exhibits an increase in distortion. However, it was conjectured that the Ref-RVQ codebook has a lower output entropy than that of the multipath RVQ codebook. Therefore, the Ref-RVQ design was generalized to include noiseless entropy coding. We apply it to image coding. The method is referred to as entropy-constrained Ref-RVQ (EC-Ref-RVQ). Since the RVQ scheme is able to implement very large dimensional vector quantization designs like 16/spl times/16 and 32/spl times/32 VQs, it is found highly successful in extracting linear and non-linear correlation among image pixels. We intend to implement these large dimensional vectors with the EC-Ref-RVQ scheme to realize a computationally less demanding image-RVQ design. Simulation results demonstrate that EC-Ref-RVQ, while maintaining single path search, provides 1 dB improvement in PSNR for image data over the multipath EC-RVQ.

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