Multiscale Edge Coding and Adaptive Lifting for Depth Maps Coding in 3-D Video

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A depth image represents three-dimensional scene information and is commonly used for depth image based rendering (DIBR) to support 3-D video applications. Reconstruction errors around depth edges lead to image blurring in synthesized views. This paper proposes a new coding method to improve the depth edge preserving effect. It makes use of both edge regularity and grayscale regularity to model the depth map, where the edge regularity is modeled by multiscale beamlet representation and the grayscale regularity is modeled by edge adaptive wavelet transform.

Fig.1 shows the framework of the proposed method. First, the depth edges are detected using Canny detector and represented by multiscale beamlet transform[1], and an optimal quadtree based beamlet representation is obtained by the well-known bottom-up tree pruning techniques, the beamlet coefficients are coded by predictive coding method which makes use of the neighborhood property of beamlets and organized from coarse to fine order. Then, an edge adaptive wavelet transform is used to model the grayscale regularity both in smooth regions and along the depth edges. By preventing wavelet bases from crossing edges, it could obtain small wavelet coefficients along the depth edges, so the high frequency coefficients are suppressed and nearly invisible. Finally, a quadtree based block restoration operation is used to eliminate the remaining artifacts. Experimental results show that the proposed method can preserve the depth edges efficiently and hence obtain higher rendering quality than existing methods, especially at low bit rate.
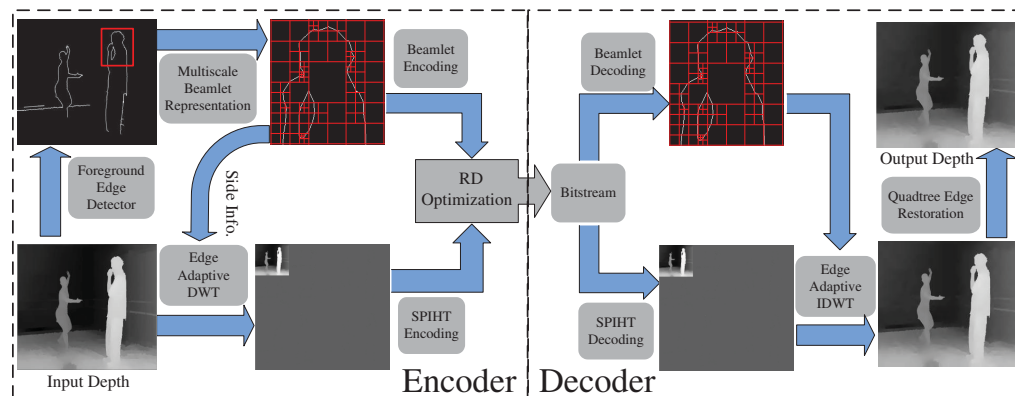

Figure 1: Overview of the proposed depth coding scheme.

References

[1] X. Huo and J. Chen, "JBEAM: Multiscale curve coding via beamlet," *IEEE Trans. Image Process.*, vol. 14, no. 11, pp. 1665-1677, 2005.

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