

An Improved Pyramid for Spatially Scalable Video Coding

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1 Introduction

Problem

- Spatially scalable video coding

Critically Sampled Spatial Wavelet Schemes

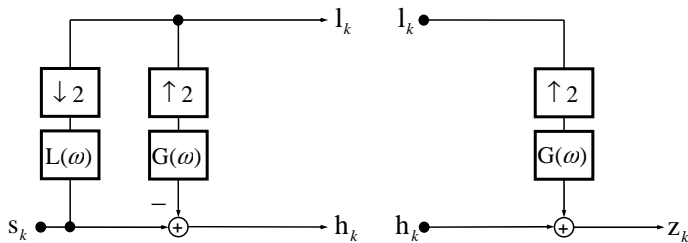
- Critically sampled high-bands are shift-variant
- Efficient motion compensation is challenging

Overcomplete Spatial Representations

- Can be shift-invariant for all subbands
- Efficient motion compensation
- Problem:** Compression efficiency

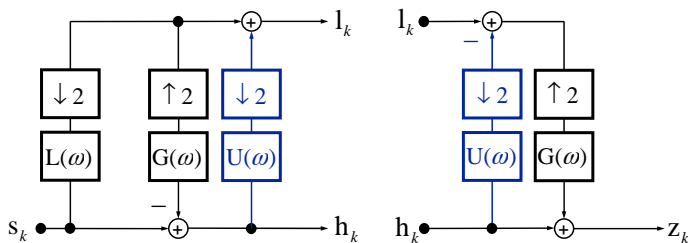
Goal

- Improve efficiency of the Laplacian pyramid



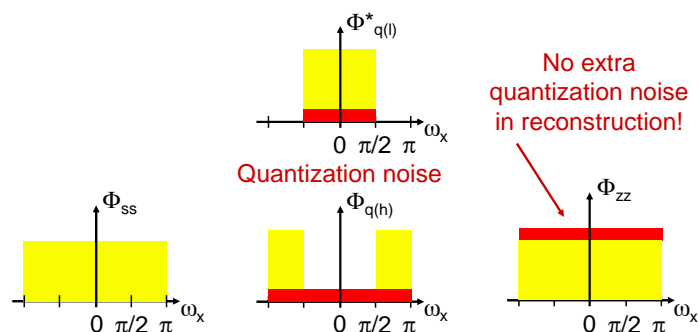
2 Lifted Pyramid

Additional Spatial Lifting Step



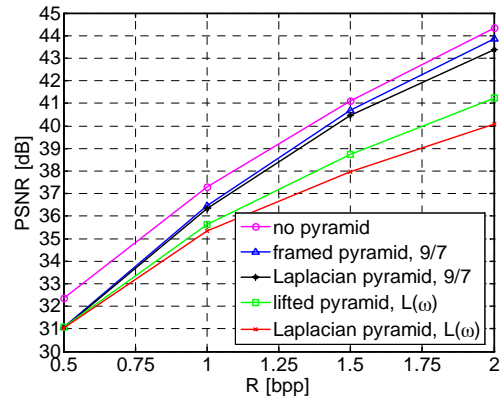
- Update the coarse signal by filtering and downsampling the detail signal
- Perfect reconstruction for any set of filters $\{L(\omega), G(\omega), U(\omega)\}$
- Special case: If $L(\omega) = U(\omega) := H(\omega)$ and if $H(\omega)$ and $G(\omega)$ are biorthogonal with respect to the sampling lattice 2, then the **framed pyramid** [1] is obtained. In this case, the resulting update signal at the analysis is zero.

Decomposition with Ideal Low-Pass

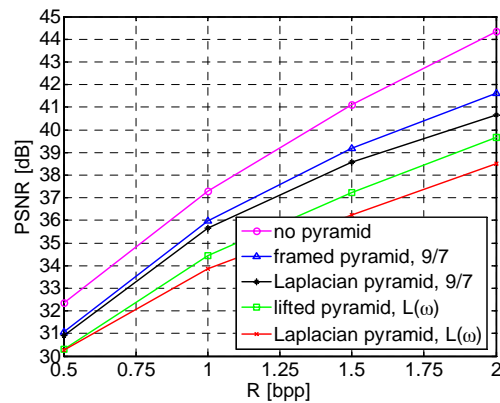


3 Experiments

Intra Coding of Spatial Subbands

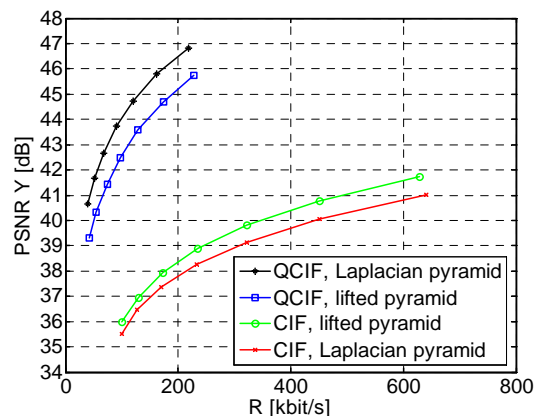


City, 1st image
4CIF, 1-level
decomposition



City, 1st image
4CIF, 2-level
decomposition

MCTF Coding of Spatial Subbands with JSVM



Container Ship
CIF, 30 fps
1-level decomp.
 $QP^{(h)} = QP^{(l)} + 6$

Acknowledgement

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References

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- M. Flierl and P. Vanderghyest, "Inter-resolution transform for spatially scalable video coding," in Proc. PCS, San Francisco, CA, Dec. 2004.

