NOISE PROCESSING FOR SIMPLE LAPLACIAN PYRAMID SYNTHESIS BASED ON DUAL FRAME RECONSTRUCTION

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Abstract :
The Laplacian pyramid (LP) provides a frame expansion. Thus, there exist infinitely many synthesis operators which achieve perfect reconstruction in the absence of quantization. However, if the subbands are quantized in the open−loop mode then the dual frame synthesis operator, which is the pseudo−inverse of the analysis operator, minimizes the mean squared error (MSE) in the reconstruction. Note that this requires modification of the conventional simple synthesis scheme. For the open−loop mode, we propose novel quantization noise processing at the encoder that allows us to achieve the same performance as dual frame reconstruction and yet retain the simple synthesis scheme at the decoder. This has the advantage that the decoder can be simple in structure as well as be agnostic of whether the encoder was open−loop or closed−loop and achieves minimum MSE reconstruction for both cases. Experimental results show a gain of around 1 dB with the dual frame reconstruction compared to the simple synthesis operator.
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Furthermore, experiments confirm that this gain can also be obtained by retaining the simple synthesis operator and performing the proposed quantization noise processing at the encoder.