

Hierarchical Anchoring of Motion Fields for Fully Scalable Video Coding

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Breakpoint-Adaptive Wavelet Transform

:: Lifting-based wavelet implementation allows to incorporate discontinuities. We use **breakpoints** to signal discontinuities.

Analysis: Predict and Update





Temporal Breakpoint Warping

:: Mapping discontinuity information from reference to target frames.



Synthesis: Undo Update, undo Predict



Novel Anchoring of Motion Fields

:: The proposed **hierarchical anchoring** of motion fields at reference frames allows to **reuse** them at finer temporal levels.





Scaling of Motion fields

Inferring of Motion fields

 $\hat{M}_{2k+1 \to 2k+2}^{(t)} = M_{2k \to 2k+2}^{(t)} \circ (M_{2k \to 2k+1}^{(t)})^{-1}$



Motion Field Warping

:: Motion fields are warped from reference to target frames using a cellular affine warping process which is guaranteed to leave no holes.

Experimental Results

:: Experiments on synthetic data show how the proposed scheme is able to reliably warp motion fields, which leads to improved R-D performance.

Synthetic Test Sequence



Motion Field Warping











The proposed motion field warping allows to **detect local expansion and contraction** in the motion field.

Resolving Double Mappings

:: We propose a method to resolve double mappings which involves a 1D search for intersection(s) with discontinuities in the motion field.



Breakpoint Warping



Ground Truth Breakpoint Field

Warped Breakpoint Field



Rate-Distortion Curves

Thin Objects \rightarrow Resolve in reference frame



Conclusions and Future Work

- \checkmark
 - Hierarchical Anchoring requires motion fields to be warped
 - ✓ Disocclusion and folding map → guide temporal update steps
 ✓ Robust method to resolve double mappings
 - Internelate metion in diseasluded regions
 - Interpolate motion in disoccluded regions
 - Breakpoint warping from temporally coarser to finer levels



Extension to a **temporal 5/3 wavelet transform**, which will **reduce** the **prediction residuals** in discollcuded regions