Visual Analysis and Synthesis with Physically Grounded Constraints

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Goal
Integrate physically grounded constraints (geometry, motion) into patch-based optimization frameworks

Motivation
Image priors work only in 2D image planes

Image Completion
Filling with mid-level guidance
• Planar orientations
• Translational symmetry

Video Completion
Reconstructing appearance and motion
• Dense flow field estimation
• Temporally coherent completion

Image Super-Resolution
Super-resolving with transformed self-exemplars
• Compositional transformation models
• Search affine and perspective transformed exemplars

Future Directions
• Smarter image/video synthesis and manipulation
• Unsupervised and weakly supervised feature representation learning
• Low shot scene understanding

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