Semantically Coherent Co-segmentation and Reconstruction of Dynamic Scenes
Motivation

• Semantic co-segmentation and reconstruction of complex scenes

• Multi-view, wide-baseline and moving handheld cameras

• Temporal semantic coherence across sequence
Framework

Input Videos

Initial Semantic Segmentation

FCNs produce segmentations with poorly localized object boundaries
Framework

Input Videos → Initial Semantic Segmentation → Initial Semantic 3D Reconstruction
Framework

Input Videos → Initial Semantic Segmentation → Initial Semantic 3D Reconstruction

Semantic tracklets:
- Temporal coherence
- Appearance, Shape and Semantic similarity
Framework

Joint multi-view optimization:

\[ E(l,d) = \alpha E_{\text{data}}(d) + \gamma E_{\text{appearance}}(l) + \mu E_{\text{semantic}}(l) + \beta E_{\text{smooth}}(l) + \eta E_{\text{contrast}}(l,d) \]
Framework

Input Videos → Initial Semantic Segmentation → Initial Semantic 3D Reconstruction → Complete Scene Reconstruction

Semantic Tracklets

Frame 11
Frame 42
Frame 26
Framework

Input Videos → Initial Semantic Segmentation → Initial Semantic 3D Reconstruction → Complete Scene Reconstruction → Semantically Coherent Segmentation
Results

Original image  
Initial semantic segmentation (FCN)

Semantic co-segmentation  
Semantic reconstruction
Results

Original videos

Semantic reconstruction

Semantic co-segmentation

Semantic segmentation comparison
Results

Input videos

Semantic reconstruction

Semantic co-segmentation
Results

Input videos

Semantically coherent reconstruction

Semantic segmentation comparison
Conclusion

• Semantic co-segmentation and reconstruction of dynamic scenes

• Temporal semantic coherence enforced by semantic tracklets

• Joint optimization simultaneously improves the results