

# Semantically Coherent Co-segmentation and Reconstruction of Dynamic Scenes

A. Mustafa and A. Hilton, {a.mustafa, a.hilton}@surrey.ac.uk

Website: <http://cvssp.org/projects/4d/SemRecon/>

## Motivation

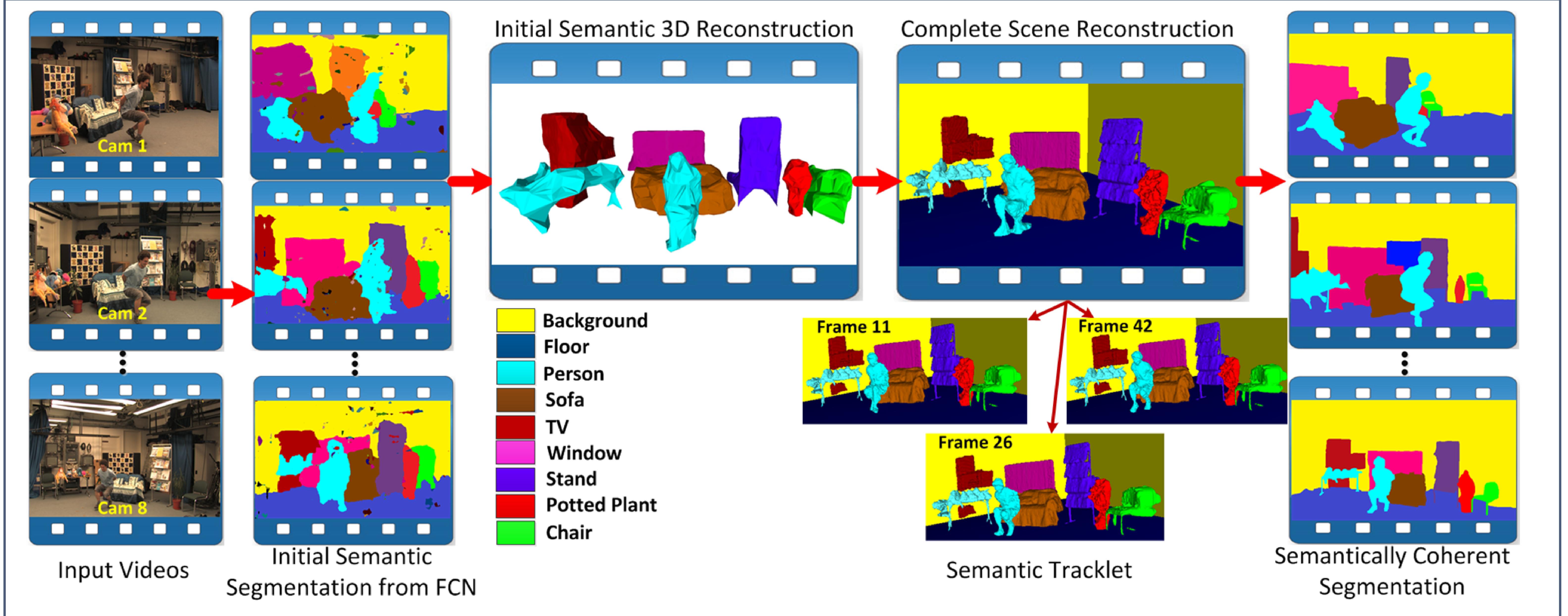
Existing techniques for dynamic scene reconstruction suffer from following limitations:

1. The quality of reconstruction of 4D dynamic scenes is limited;
2. Accurate foreground segmentation is assumed a priori (using known static background).

## Contributions

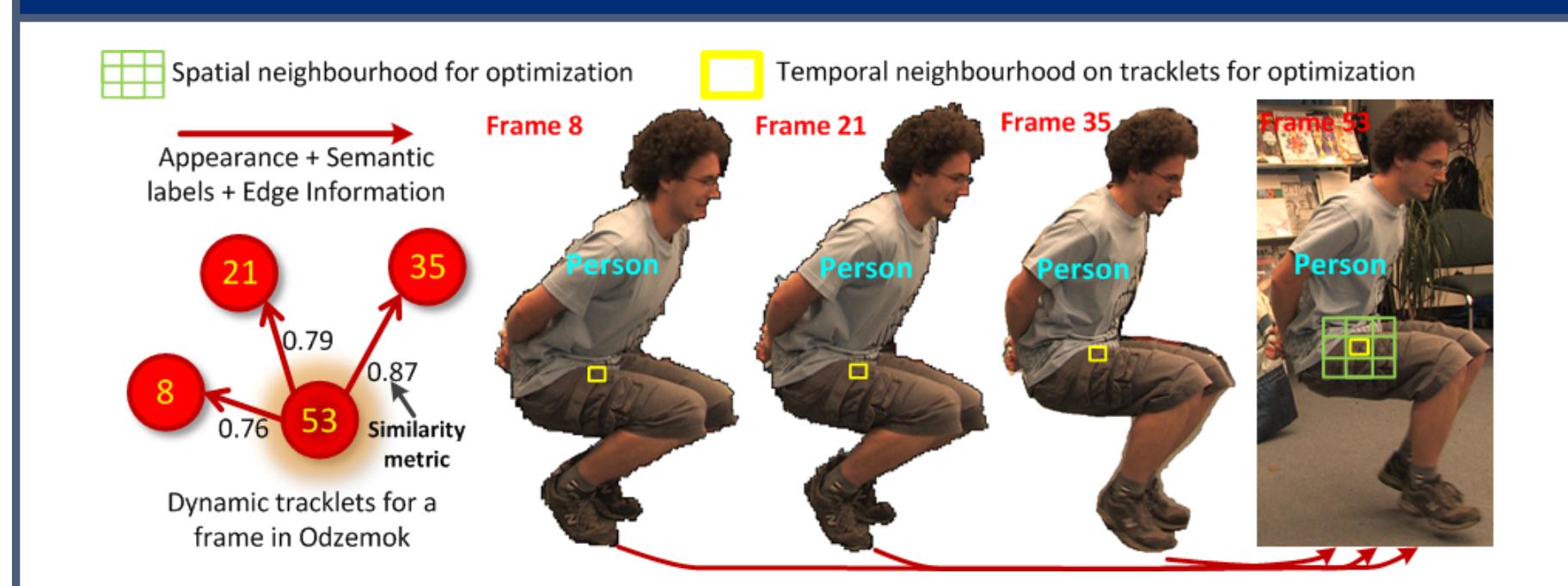
1. Joint semantic co-segmentation and reconstruction of dynamic scenes;
2. Semantic tracklets for temporally coherent semantic labelling of video;
3. Improved segmentation by enforcing multi-view semantic coherence;
4. Improved accuracy of reconstruction due to semantic tracklets across the sequence.

## Semantically coherent co-segmentation and reconstruction framework

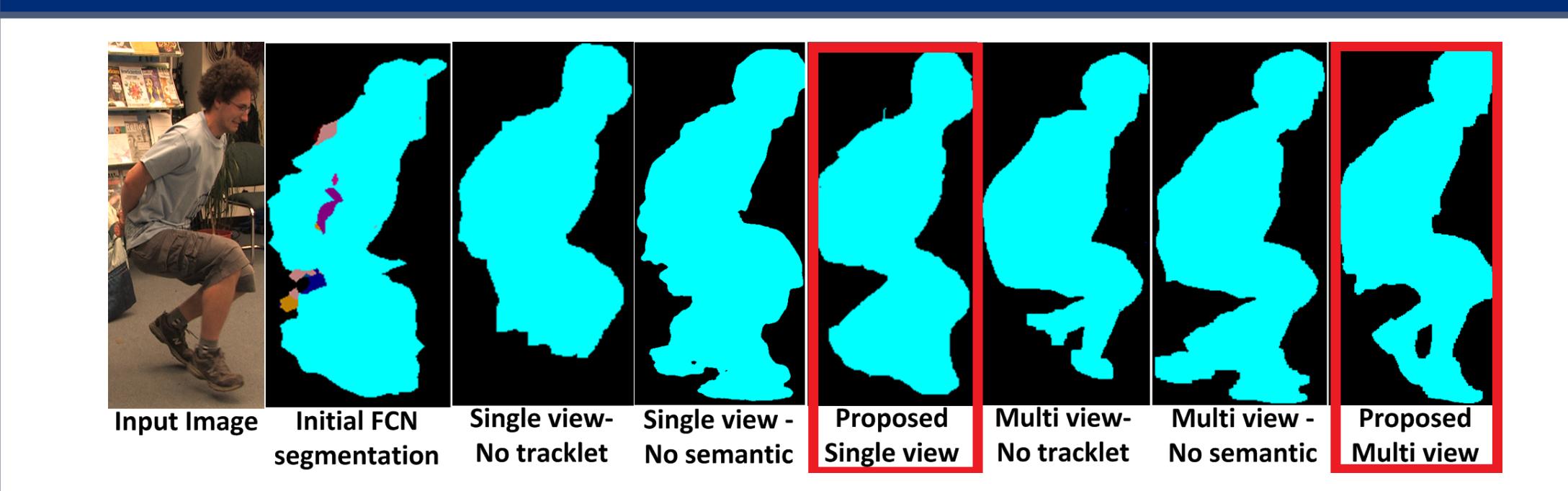


$$\text{Joint multi-view optimization: } E(l, d) = \alpha E_{\text{data}}(d) + \gamma E_{\text{appearance}}(l) + \mu E_{\text{semantic}}(l) + \beta E_{\text{smooth}}(l) + \eta E_{\text{contrast}}(l, d)$$

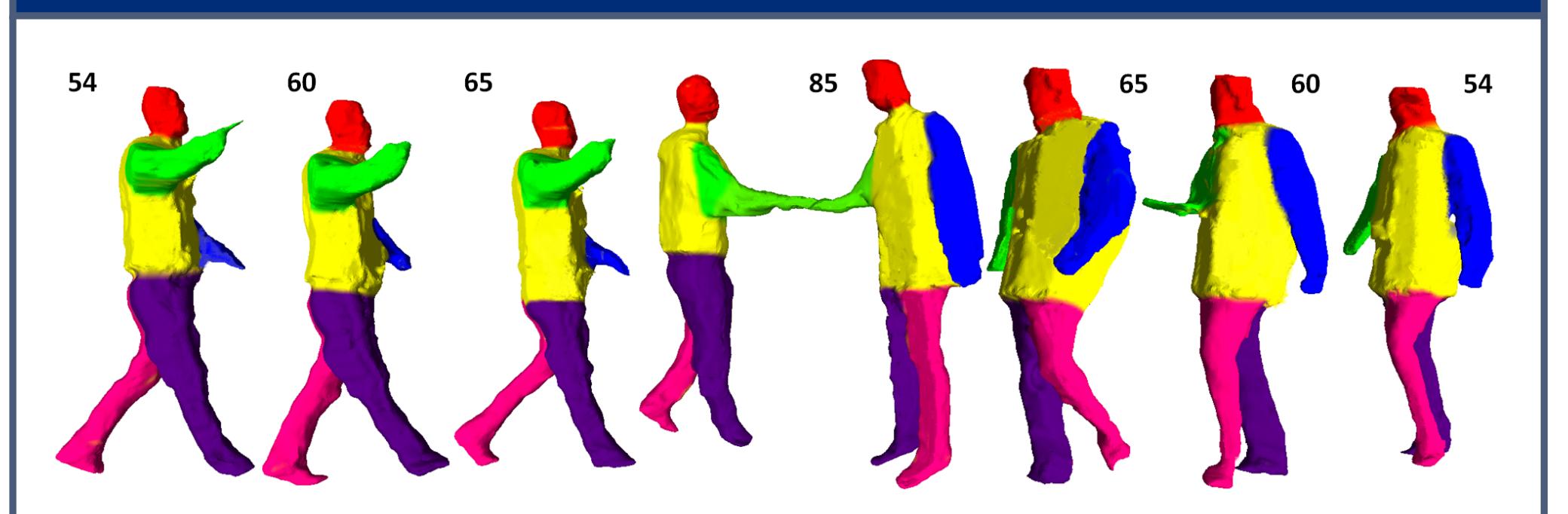
## Semantic tracklets



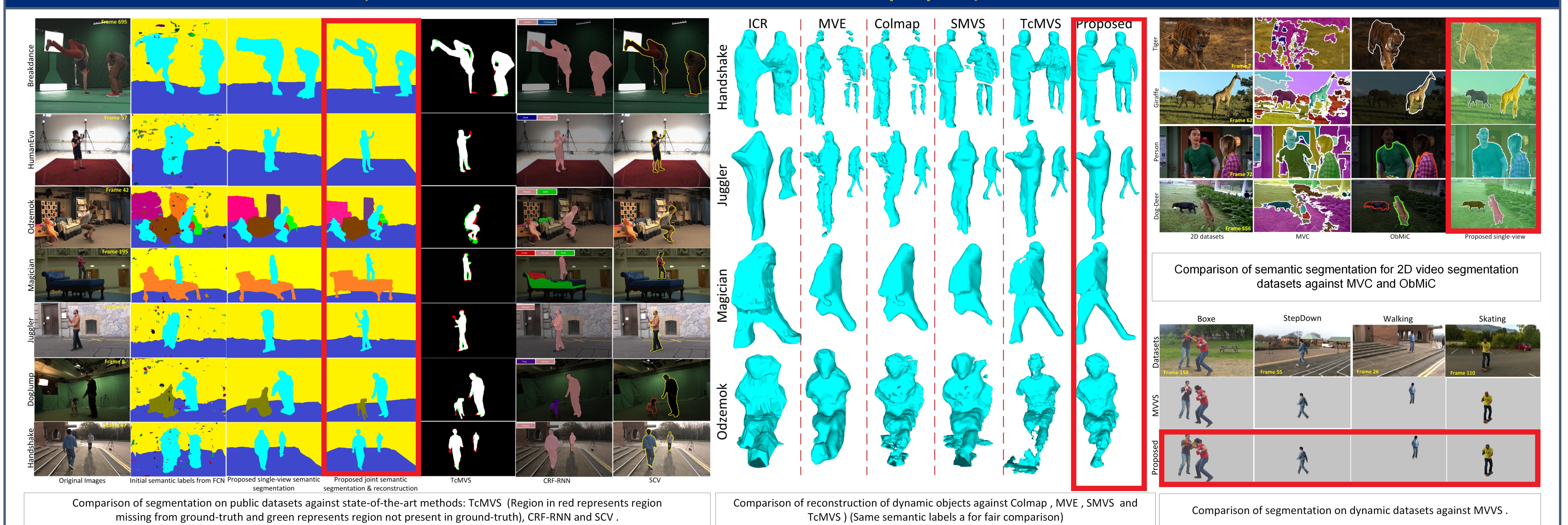
## Single-view semantic segmentation



## Semantic coherence



## Results and evaluation (Quantitative evaluation available in paper)



## References

- [1] A. Mustafa, H. Kim, J. Y. Guillemaut, A. Hilton. Temporally coherent 4D reconstruction of dynamic scenes. In CVPR, 2016. **TcMVS**
- [2] Y.-H. Tsai, G. Zhong, and M.-H. Yang. Semantic co-segmentation in videos. In ECCV, 2016. **SCV**
- [3] S. Zheng, S. Jaya, B. Paredes, V. Vineet, D. Du, C. Huang, and P. Torr. Conditional random fields as recurrent neural networks. In ICCV, 2015. **CRF-RNN**
- [4] B. Semerjian. A new variational framework for multiview surface reconstruction. In ECCV, 2014. **MVE**
- [5] F. Langguth, K. Sunkavalli, S. Hadap, and M. Goesele. Shading-aware multi-view stereo. In ECCV, 2016. **SMVS**

## Acknowledgement

This research was supported by the InnovateUK grant for Live Action Lightfields for Immersive Virtual Reality Experiences (ALIVE) project (grant 102686).