4D Temporally Coherent Dynamic Light-field Video

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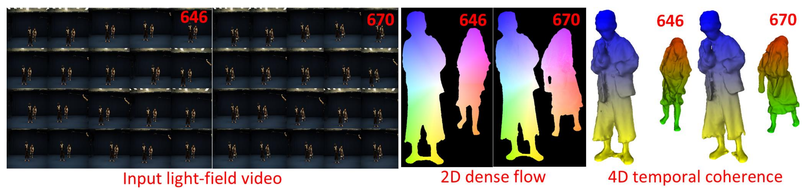
MOTIVATION

Existing light-field methods suffer from following limitations:

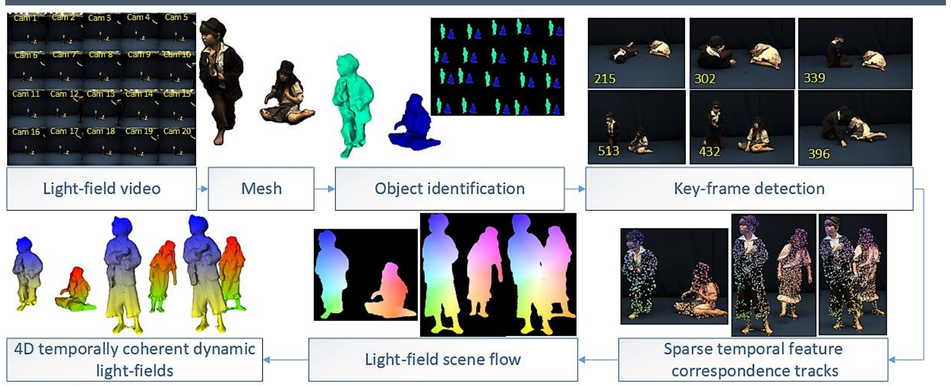
1. Limited to static scenes due to the requirement to acquire a dense scene representation;
2. Large amount of data and the absence of methods to infer temporal coherence pose major challenges in storage, compression and editing.



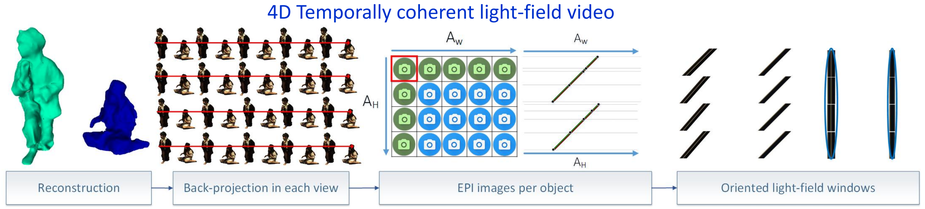
CONTRIBUTIONS

1. Temporally coherent 4D reconstruction of dynamic light-field video;
2. EPI from sparse light-field video for spatio-temporal correspondence;
3. Sparse-to-dense light-field scene flow exploiting EPI image information;
4. Efficient light-field video representations to facilitate editing for live action VR.

METHODOLOGY



4D Temporally coherent light-field video



EPI image from sparse light-field

ACKNOWLEDGEMENTS

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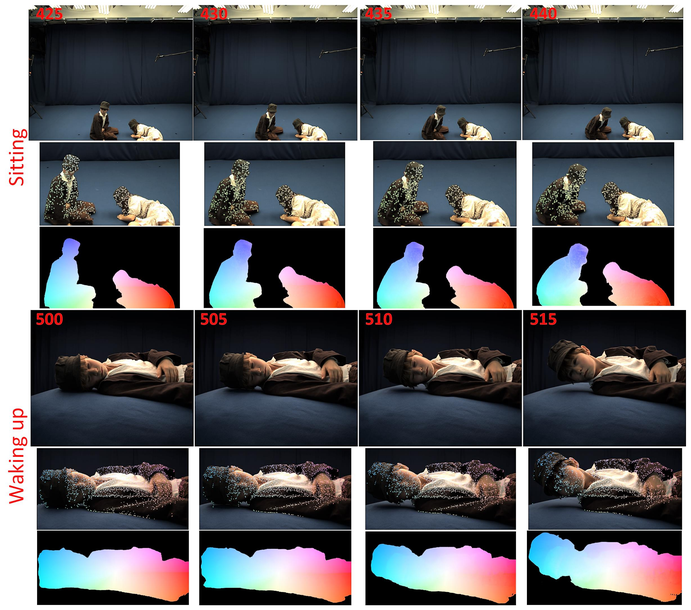
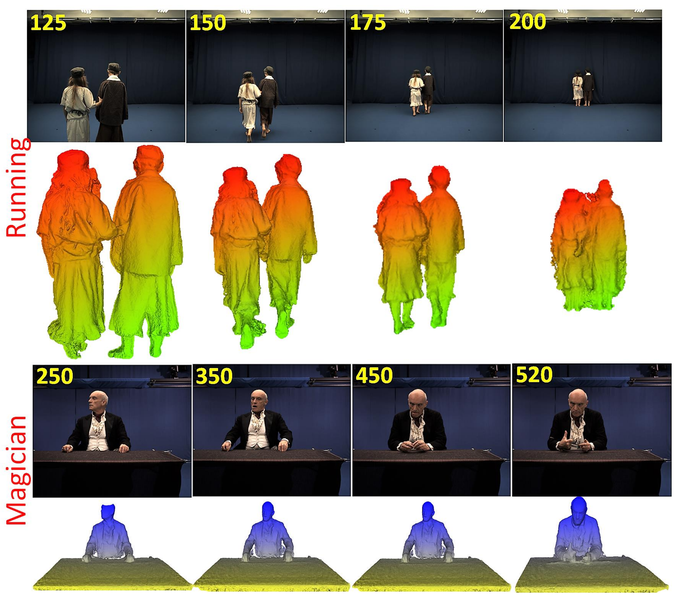
RESULTS

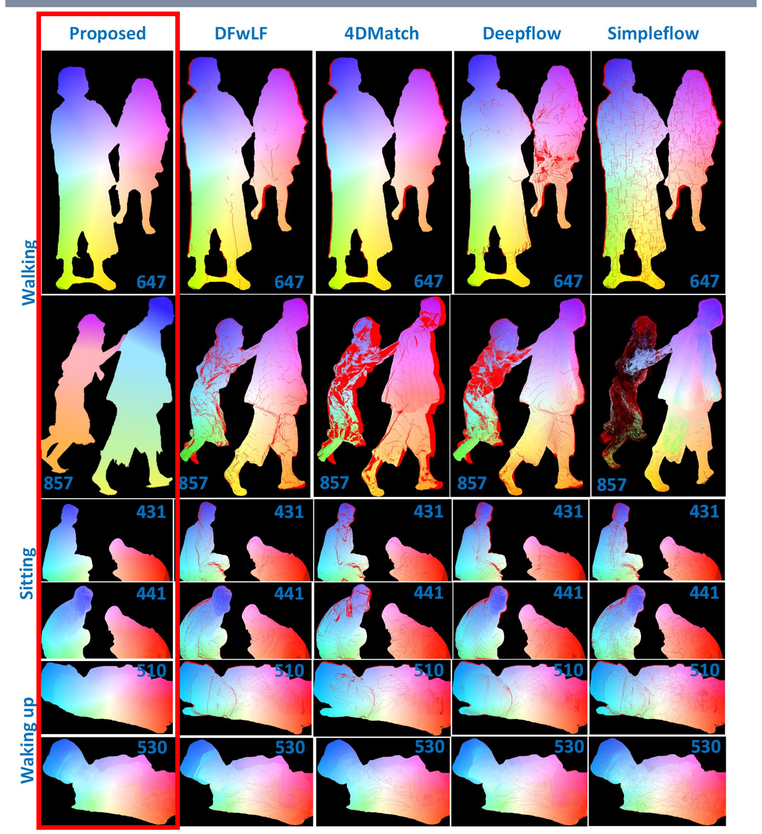


Sparse temporal correspondences and dense flow results on 2 light-field sequences: Sitting and Waking up



4D temporal alignment between frames for Walking and Magician dataset

EVALUATION



Dense flow comparison results on different light-field sequences. DEwLF: dense flow without light-field consistency, 4DMatch[1], Deepflow[3] & Simpleflow[2]

Datasets	Prop.	DFwLF	4DM	DF	SF
Walking	**0.45**	0.59	0.58	0.81	1.05
Sitting	**0.51**	0.73	0.71	1.13	1.83
Waking up	**0.39**	0.56	0.53	0.89	1.17
Running	**0.65**	0.87	0.92	1.23	1.95
Magician	**0.59**	0.82	0.83	1.05	1.67

Silhouette overlap error for all the datasets. Prop. represents proposed approach, 4DM is 4DMatch, DF is Deepflow and SF is Simpleflow

REFERENCES

1. A. Mustafa, H. Kim, and A. Hilton. 4d match trees for non-rigid surface alignment. In ECCV, 2016
2. M.W. Tao, J. Bai, P. Kohli, and S. Paris. Simpleflow: A noniterative, sublinear optical flow algorithm. In Eurographics, 2012
3. P. Weinzaepfel, J. Revaud, Z. Harchaoui, and C. Schmid. Deepflow: Large displacement optical flow with deep matching. In ICCV, 2013