4D Match Trees for Non-rigid Surface Alignment

A. Mustafa, H. Kim and A. Hilton, {a.mustafa, h.kim, a.hilton}@surrey.ac.uk

ECCV'16
EUROPEAN CONFERENCE
ON COMPUTER VISION

UNIVERSITY OF
SURREY

Motivation

Existing techniques for 4D dynamic scene reconstruction suffer from following limitations:
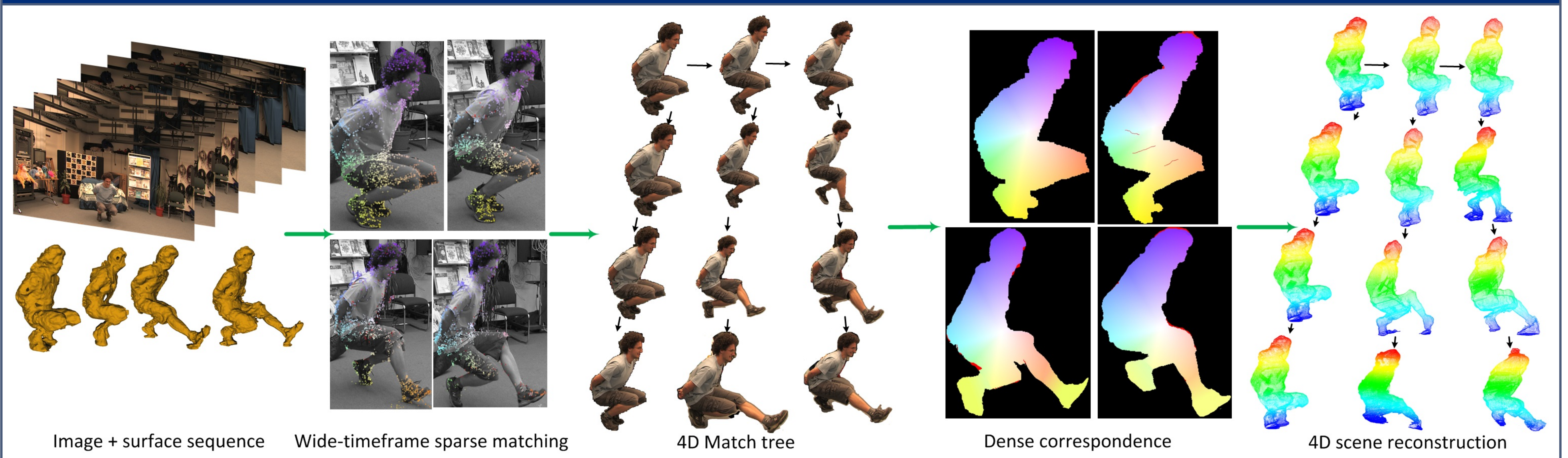1. Assume a full reconstruction of object surface at each time frame;
2. Sequential alignment of partial surfaces suffers from errors due to drift and failure for rapid and complex motion [1];
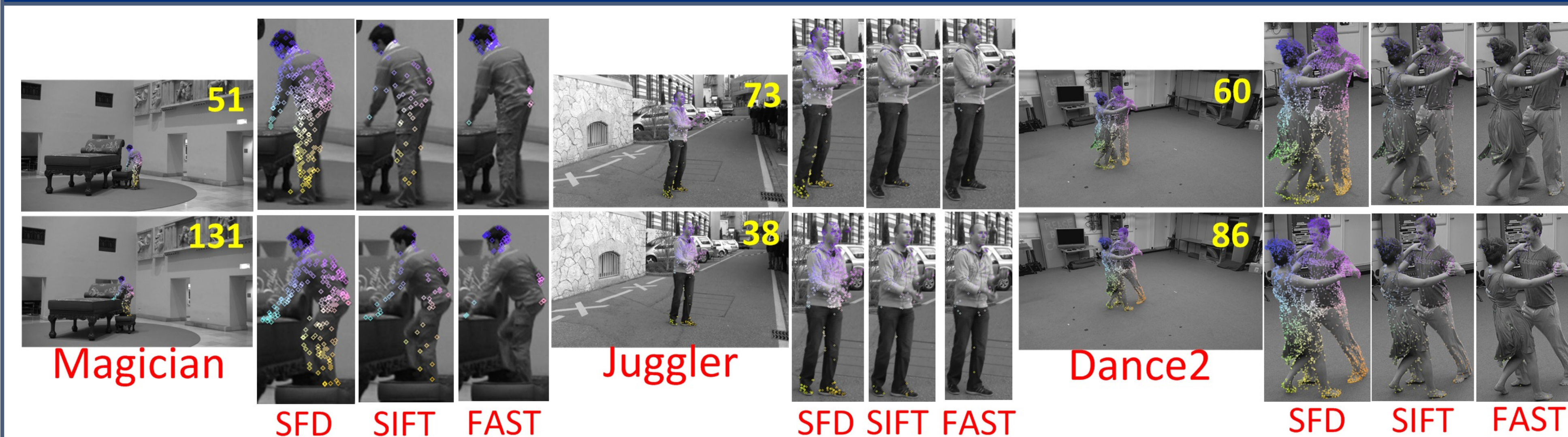
Contributions

Contributions of this work:
1. 4D Match Trees for non-sequential global alignment of partial reconstructions of non-rigid shape from single or multiple-view [3] sequences;
2. Sparse wide-timeframe matching between image pairs of non-rigid shape using a segmentation-based feature detector [2];
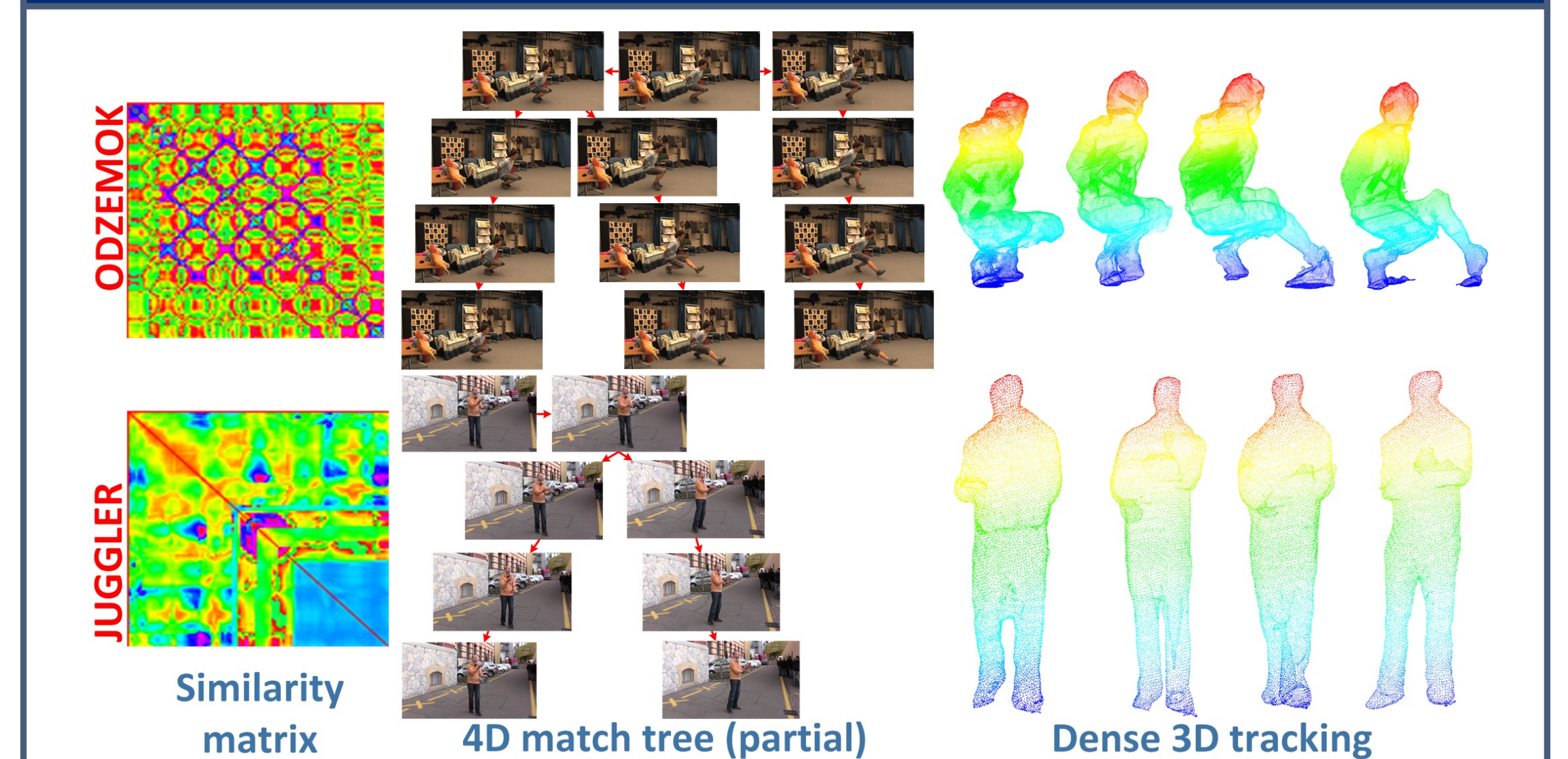
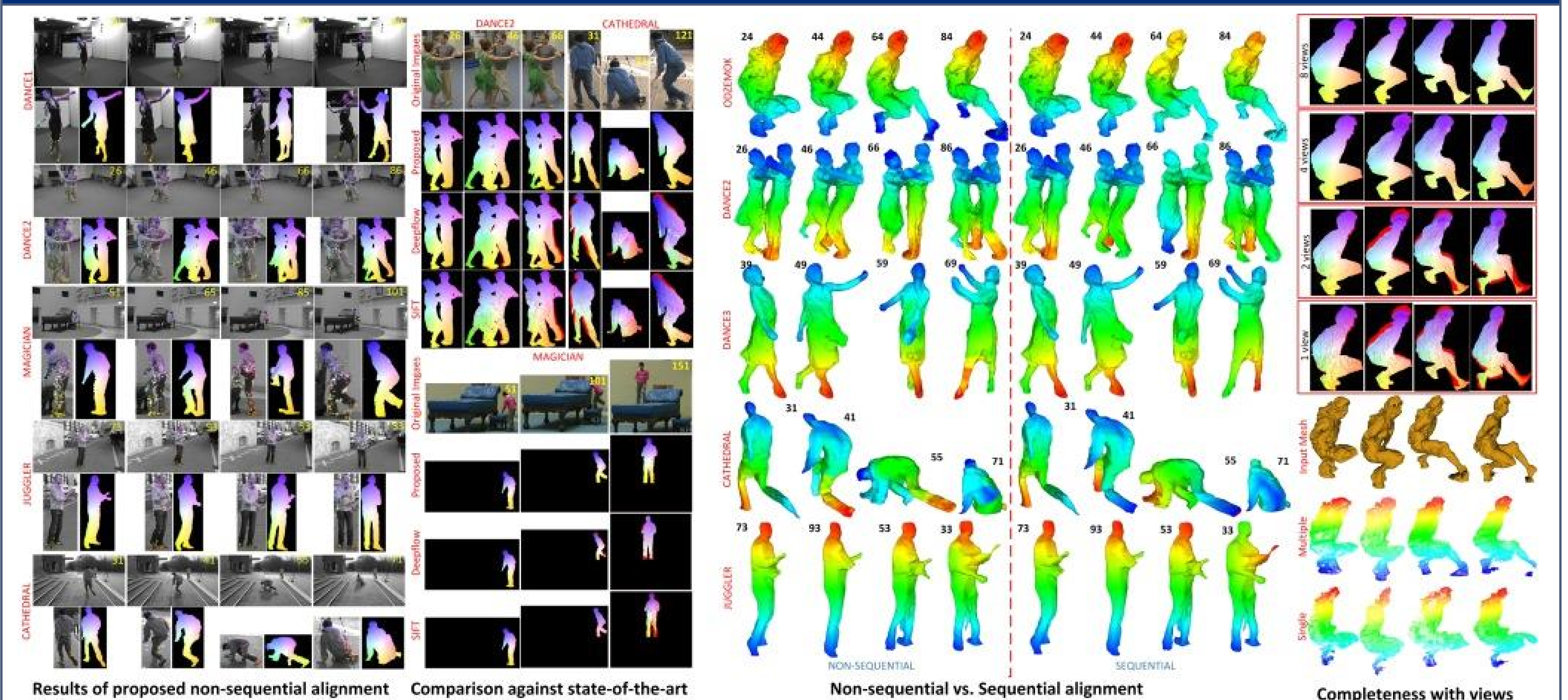## 4D Match Tree framework for global alignment of partial surface reconstructions

Image + surface sequence   Wide-timeframe sparse matching   4D Match tree   Dense correspondence   4D scene reconstruction

Robust wide-timeframe sparse correspondence

Magician   51   131   SFD   SIFT   FAST
Juggler   73   38   SFD   SIFT   FAST
Dance2   60   86   SFD   SIFT   FAST

Non-sequential Alignment

ODZEMOK   JUGGLER   Similarity matrix   4D match tree (partial)   Dense 3D tracking

Results and Evaluation

Results of proposed non-sequential alignment   Comparison against state-of-the-art   Non-sequential vs. Sequential alignment   Completeness with views

References

[1] P. Weinzaepfel, J. Revaud, Z. Harchaoui, C. Schmid: Deep flow: Large displacement optical flow with deep matching in *ICCV*, 2013.
[2] A. Mustafa, H. Kim, E. Imre, A. Hilton. Segmentation based features for wide-baseline multi-view reconstruction in *3DV*, 2015.
[3] A. Mustafa, H. Kim, J. Y. Guillemaut, A. Hilton. Temporally coherent 4D reconstruction of complex dynamic scenes in *CVPR*, 2016.

Acknowledgement