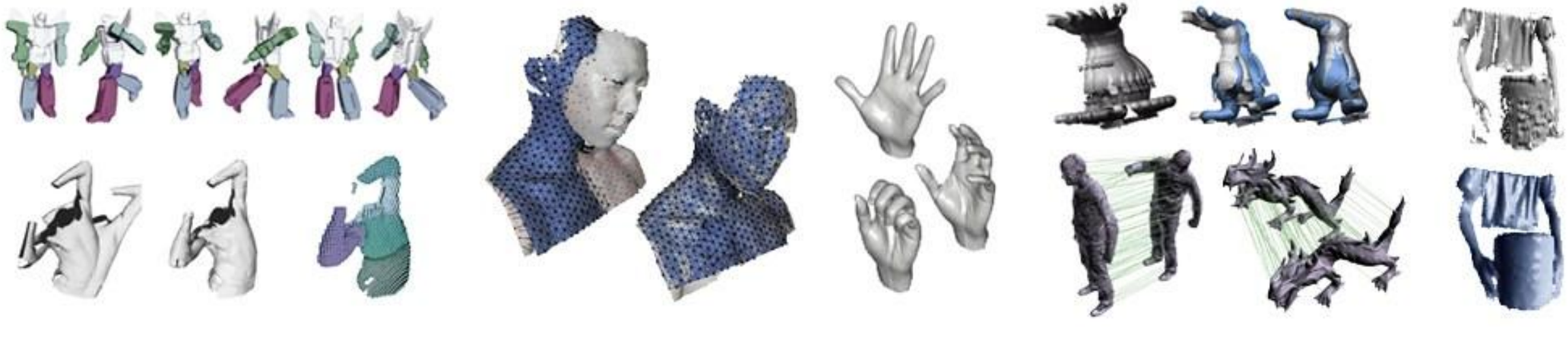
Eurographics 2012
Cagliari, Italy
May 13 - 18
33rd ANNUAL CONFERENCE OF THE EUROPEAN ASSOCIATION FOR COMPUTER GRAPHICS



Dynamic Geometry Processing

EG 2012 Tutorial

Will Chang, Hao Li, Niloy Mitra,
Mark Pauly, Michael Wand

Overview

Speakers & Topics

Presenters

Will Chang

University of California
at San Diego, USA

wychang@cs.ucsd.edu

Hao Li

Columbia University,
USA

hao@inf.ethz.ch

Niloy Mitra

University Colledge
London, UK

n.mitra@cs.ucl.ac.uk

Mark Pauly

EPFL Lausanne
Switzerland

mark.pauly@epfl.ch

Michael Wand

Saarland University,
MPI Informatik, Germany

mwand@mpi-inf.mpg.de

Course Webpage

Course Webpage

- Updated slides
- Literature & references
- Additional material / data sets

Linked from:

- http://www.mpi-inf.mpg.de/~mwand/
- Available next week

What we cover

Basics

- Motivation, data sources, problems
- Basic correspondence estimation techniques

Dynamic Geometry Registration

- Kinematic surfaces and geometric optical flow
- Incremental deformable matching
- Deformation graphs

State-of-the-Art Techniques

- Kinect Fusion
- Faceshift

Data Sources

Where does all the data come from?

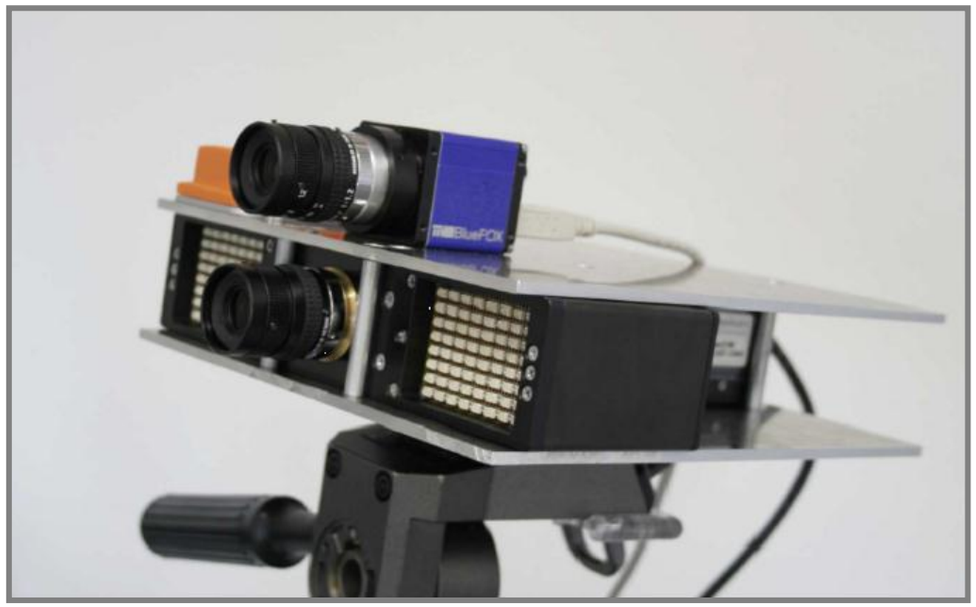
Deformable Shape Matching

New technology

- 3D animation scanners
- Record 3D video
- Active research area

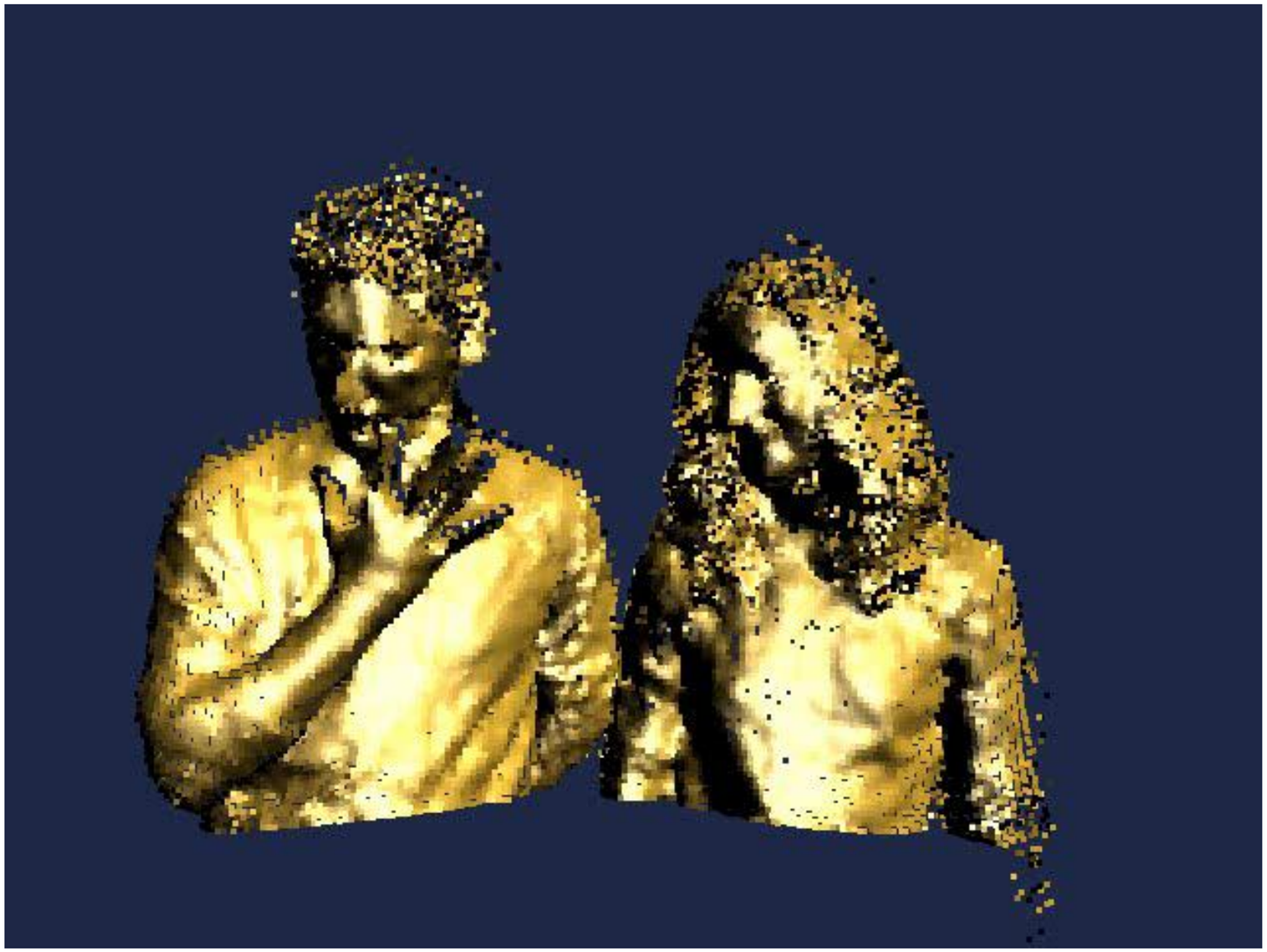
Ultimate goal

- 3D movie making
- New creative perspectives



[P. Jenke, WSI/GRIS Tübingen]

Time-of-Flight / PMD Devices



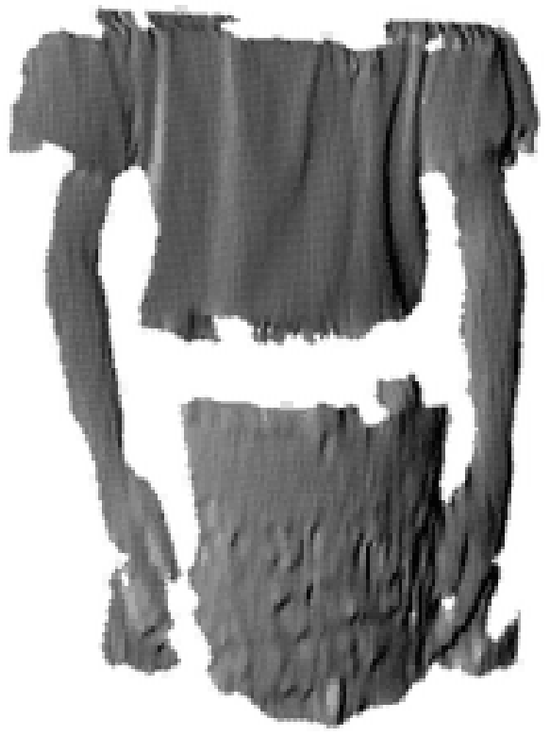
PMD Time-of-flight camera

Minolta Laser Scanner (static)

Structured / Unstructured Light Scanners

space-time stereo

courtesy of James Davis, UC Santa Cruz



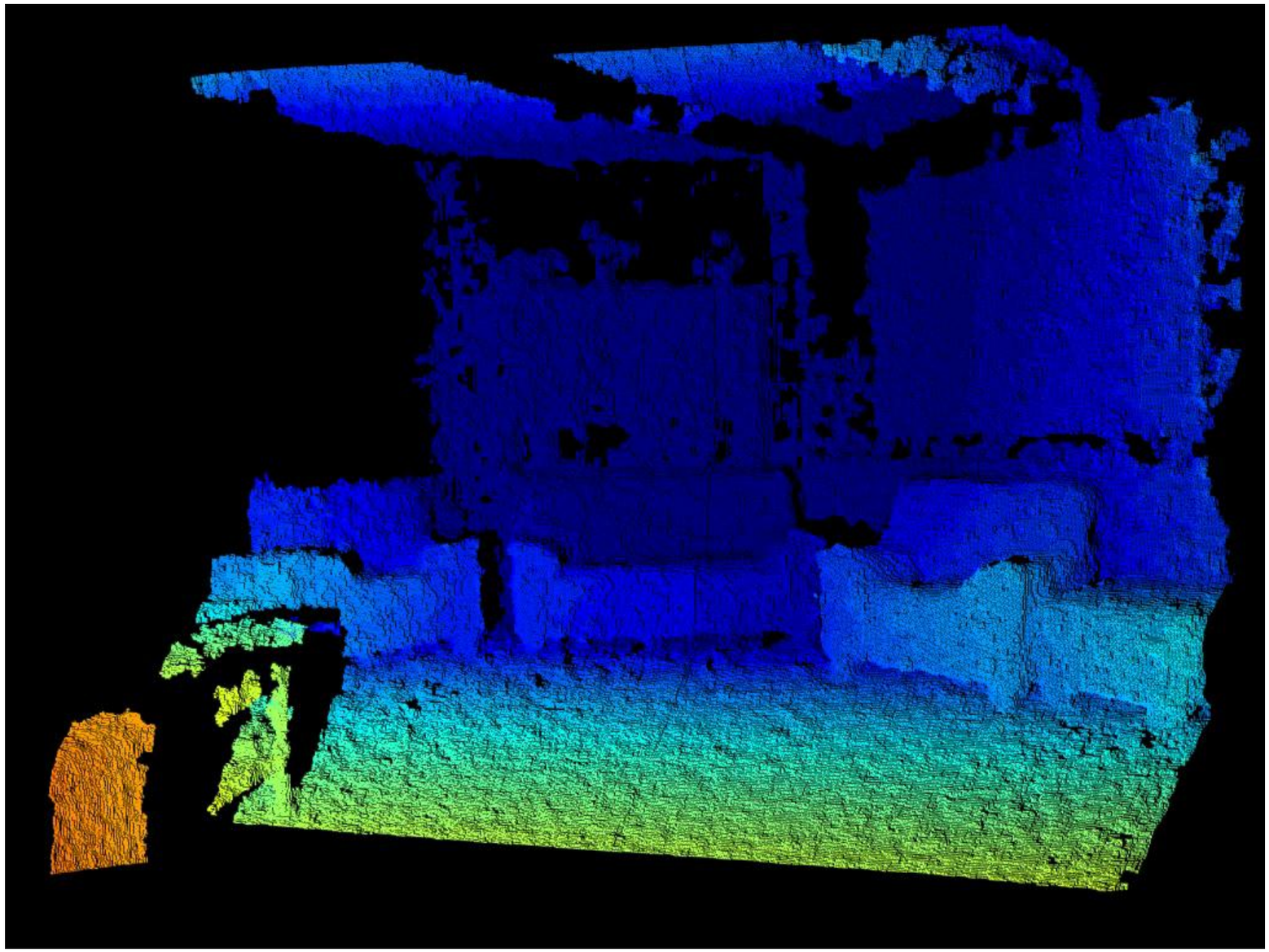
color-coded structured light

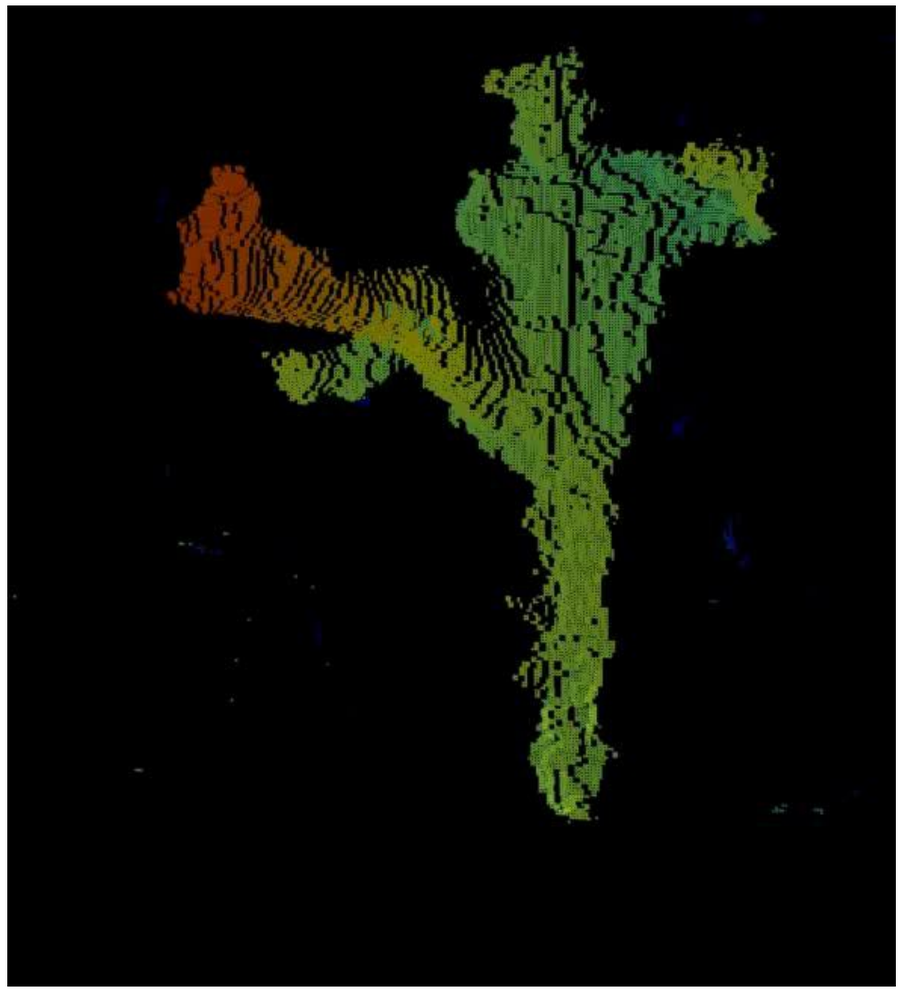
courtesy of Phil Fong, Stanford University

motion compensated structured light

courtesy of Sören König, TU Dresden

Kinect Example Data





High-End Acquisition Setup: Lightstage

[Vlasic et al., Siggraph Asia 2009]

Lightstage Example Sequence

[Vlasic et al., Siggraph Asia 2009]

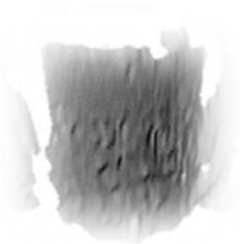
Problems & Topics

Priors on Dynamic Data

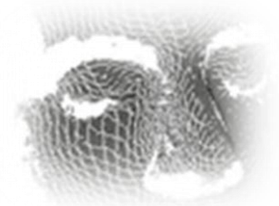
Processing Dynamic Geometry

Problems

- Noise, outliers
- Missing data
- No correspondences
- No semantics (joints, bones, expressions)



noise

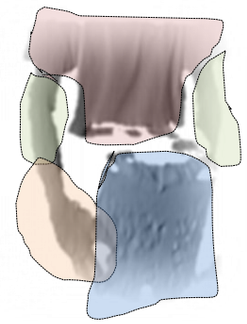


holes

missing correspondences

We discuss

- Establishing correspondences
- Reconstruction
  - Noise removal
  - Hole filling
- Data-driven priors
- Semantic rigging

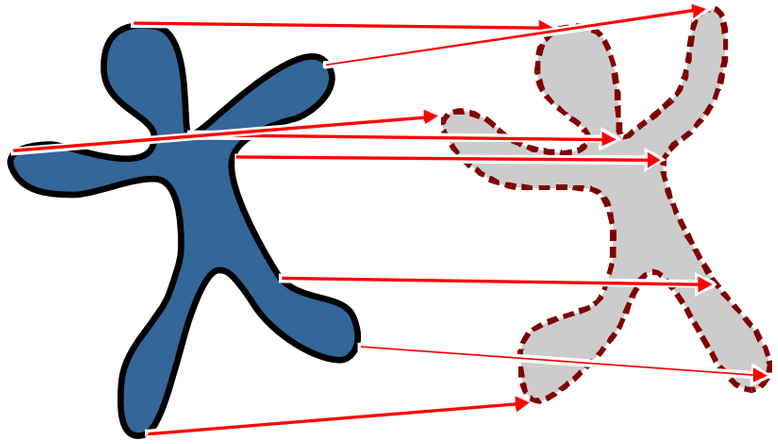


missing semantics

Correspondences

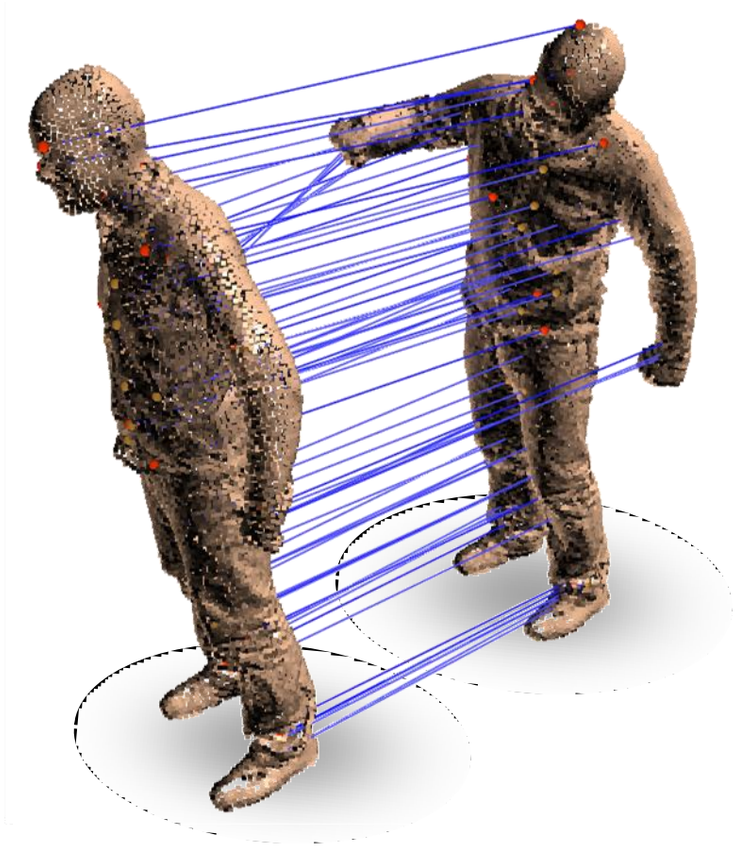
Deformable Shape Matching

- Correspondences between deformed shapes



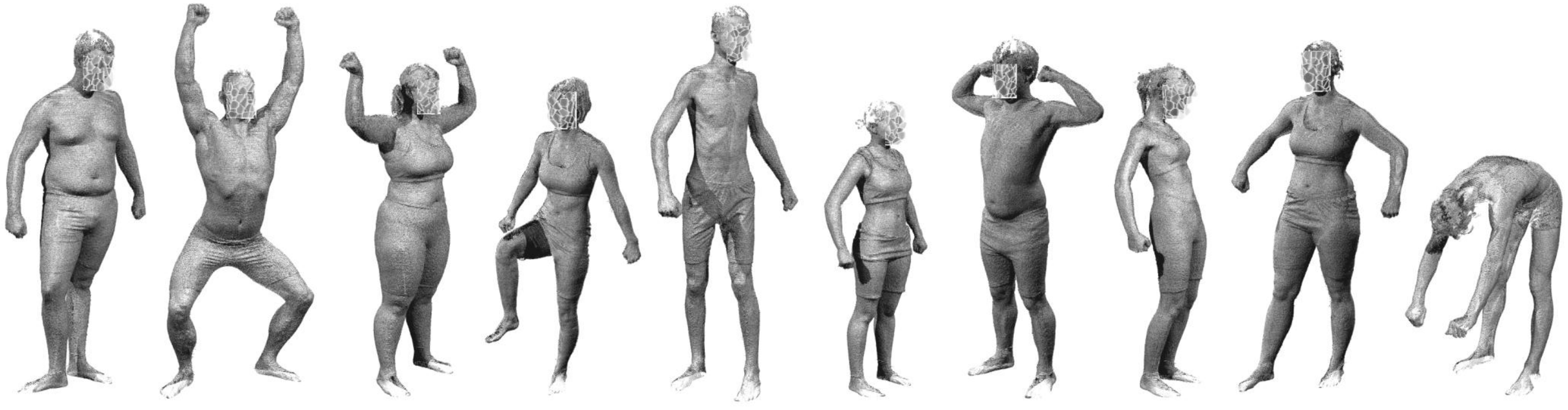
Techniques

- Kinematic surfaces
- Deformable (elastic) shape matching
- Piecewise rigid (articulated) motion



Data courtesy of C. Stoll, MPI Informatics

Data driven priors



Courtesy of N. Hassler, MPI Informatik

Morphable Shape Models

- Analyze large data base of example models
- Compute correspondences
- Build shape statistics (for example PCA)
- Statistical shape space facilitates solving inverse problems