

# Puppet Pose Capture

IM691 Research Seminar, Anna Maureder

# Idea

„Real-Time puppet motion capture for 3D animation purposes“

**tracking the motion of joints**  
**occlusion by hands**



# Idea

„Real-Time puppet motion capture for 3D animation purposes“



**No motion**  
**No occlusion**

„3D Puppet Pose Capture“

# Pose capture

## of articulated objects

3D Reconstruction

capture the shape of real models  
(3D range data, Shape-from-X)



3D Segmentation

recover rigid parts of a 3D object



Skeleton Extraction

recover joints between rigid parts

# Pose capture

## of articulated objects

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Skeleton Extraction

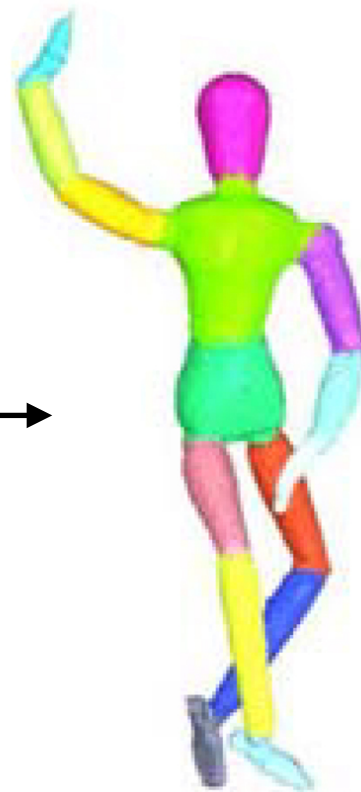
recover joints between rigid parts

# Main goal

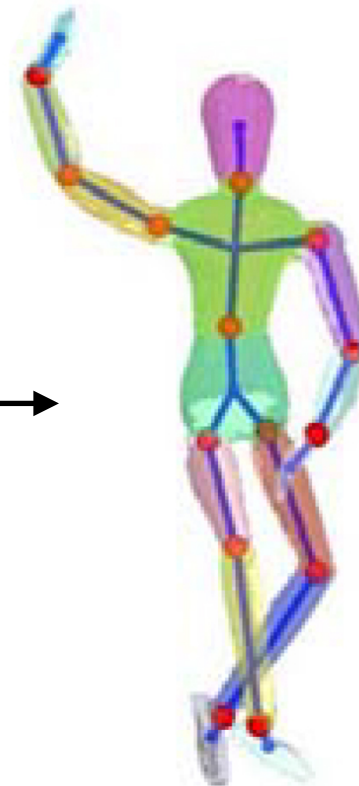
Recover the skeleton of an unknown articulated object



3D Reconstruction



3D Segmentation



Skeleton Extraction

# Non-rigid registration

- „deformable template“  
„Recovering Articulated Object Models from 3D Scan Data“, 2004, Anguelov et al.
- set of meshes of the same object ( $D_0 \dots D_N$ )



$D_0 = X$   
template mesh

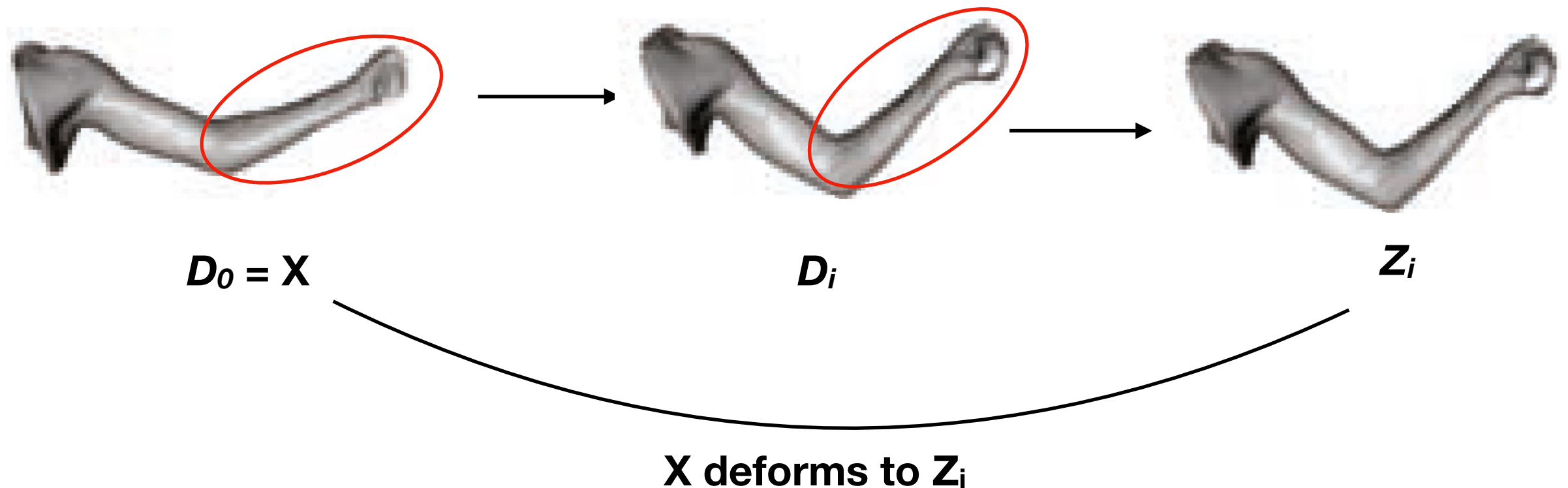


$D_1, \dots, D_N$   
data meshes

# Correlated Correspondence

Registration of nonrigid surfaces

- find corresponding points of  $X$  and  $D_i$
- find non-rigid transformation to align them





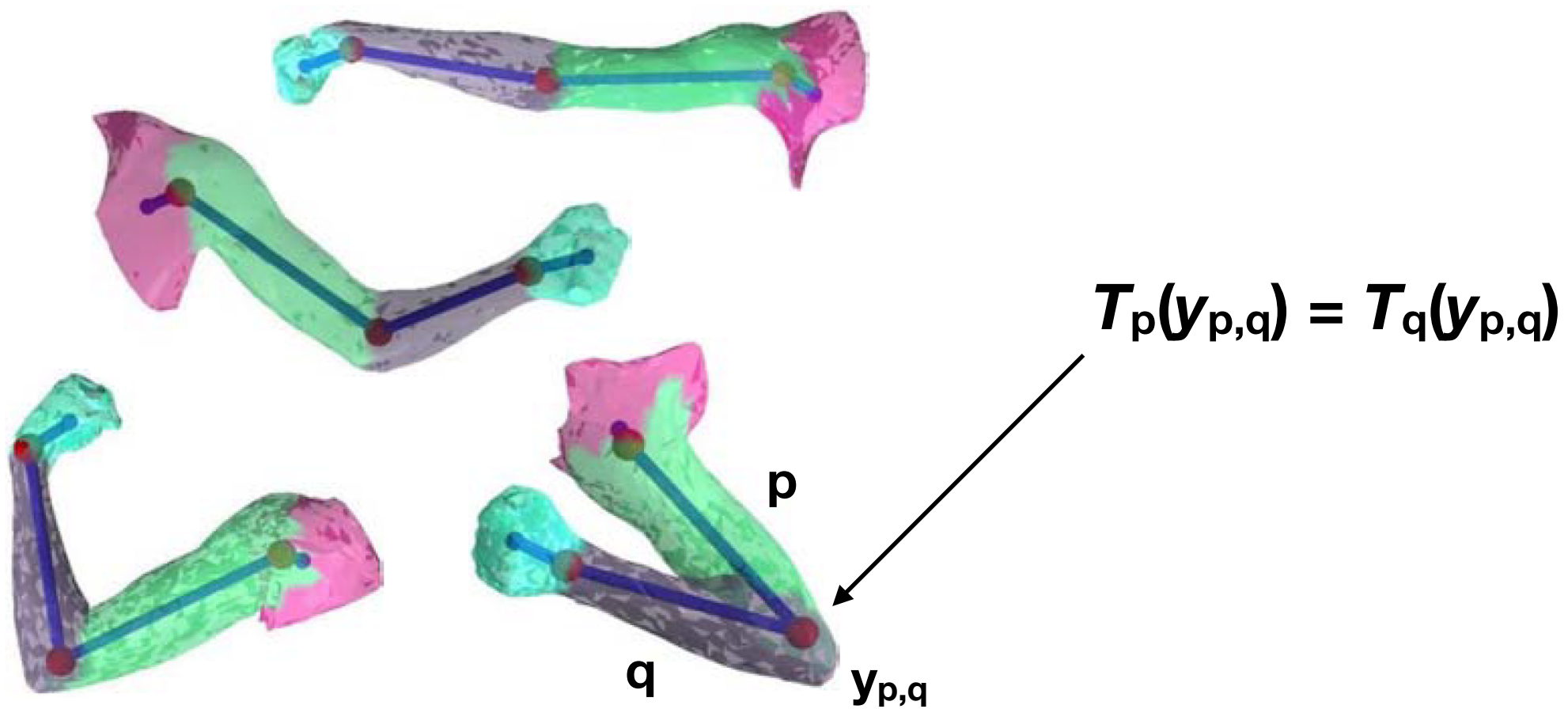
# Optimization

- performing of Expectation-Maximization algorithm

**E-step:** assignment of body labels  $\alpha$  given estimated  $T$

**M-step:** improve estimate of  $T$  using body labels  $\alpha$   
(ICP)

# Skeleton Estimation



# Further work

- „Non-rigid registration“

„Fast and precise kinematic skeleton extraction of 3D dynamic meshes“,  
J. Tierny<sub>1</sub>, J. Vandeborre<sub>1,2</sub> and M. Daoudi, 2008

„Range Scan Registration Using Reduced Deformable Models“,  
W. Chang<sub>1</sub> and M. Zwicker, 2009

„Segmenting Animated Objects Into Near-Rigid Components“,  
S. Wuhrer and A. Brunton, 2009

„Robust and Accurate Skeletal Rigging from Mesh Sequences“,  
B. Huy and L. Deng<sub>y</sub>, 2014

# Current status

- 3D Data (Kinect Fusion, RecFusion, Online data base)

.pcd/.obj/.ply/.stl

- Library (C++)

VTK, PCL

