



13th International Fall Workshop
VISION, MODELING, AND VISUALIZATION 2008
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Konstanz, Germany

Strike a Pose

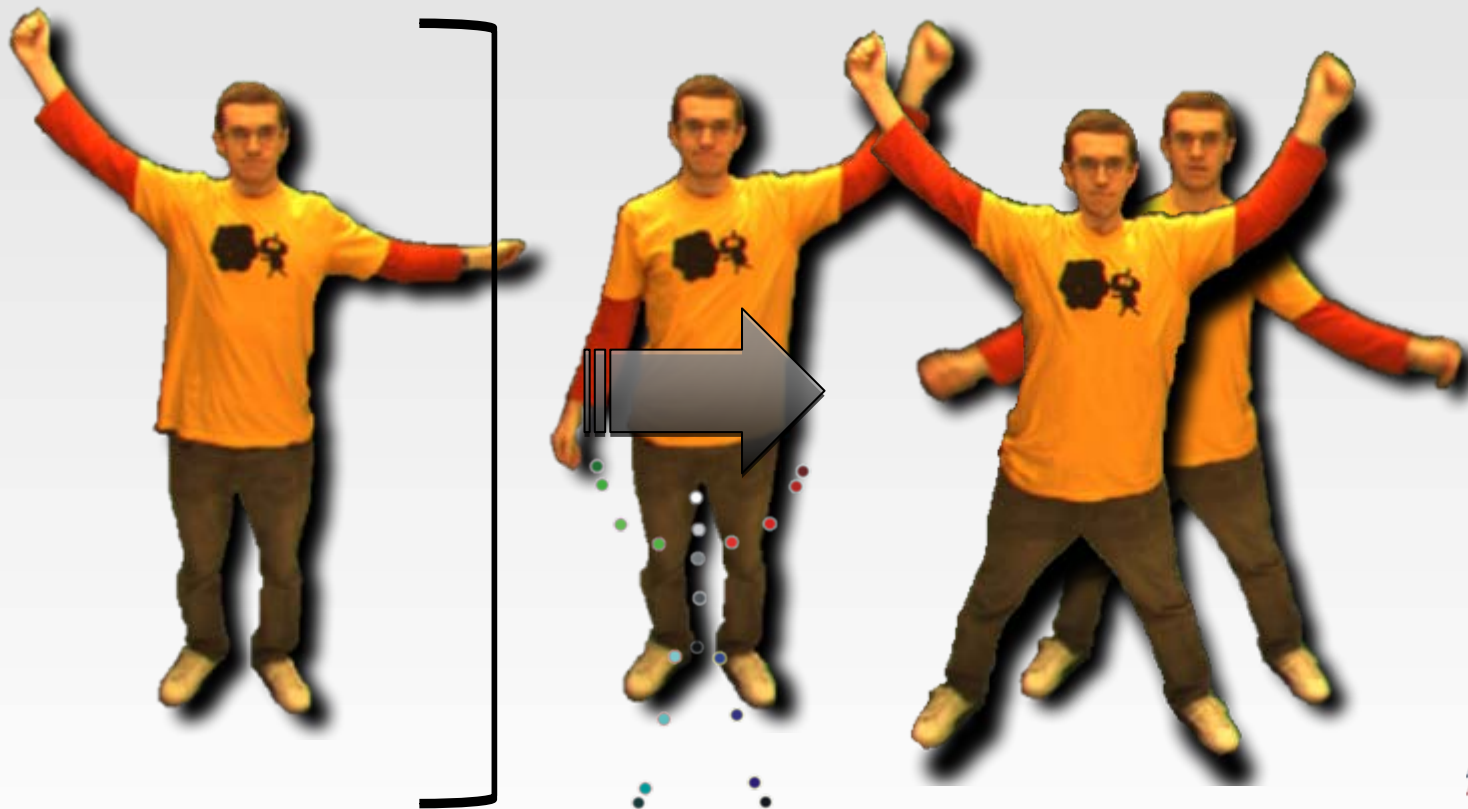
Image-Based Pose Synthesis

Cedric Vanaken, Chris Hermans, Tom Mertens,
Fabian Di Fiore, Philippe Bekaert, Frank Van Reeth

Hasselt University - Belgium

Image-Based Pose Synthesis

- Create novel poses from input images



Related Work

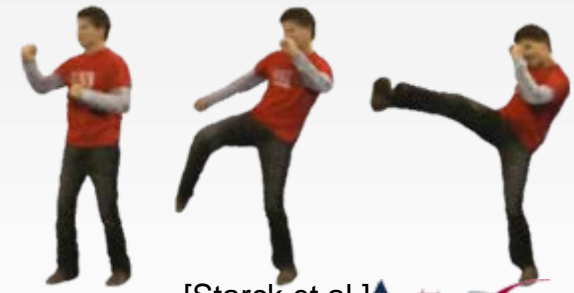
- As-Rigid-As-Possible Shape Manipulation [Igarashi et al.]
- Character Animation from 2D Pictures and 3D Motion Data [Hornung et al.]
- Video-Based Character Animation [Starck et al.]



[Igarashi et al.]



[Hornung et al.]



[Starck et al.]

Related Work

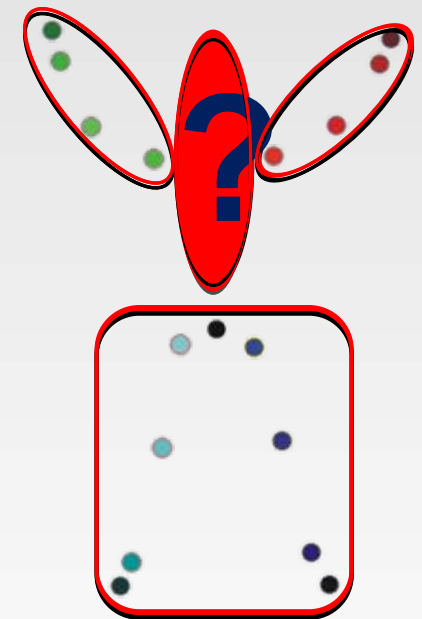
↔ standard image-based deformation:

- Multiple input images (2 - 4)
- Straightforward user-interaction
 - Assign approximate skeleton
- Higher realism in local regions
 - e.g. creases in fabrics
- Large variety of target poses
 - If similar pose available in input



Algorithm Overview

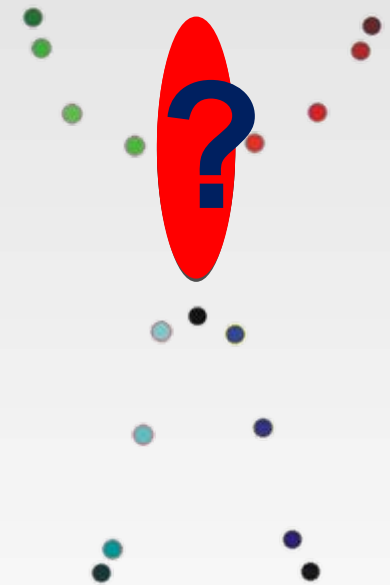
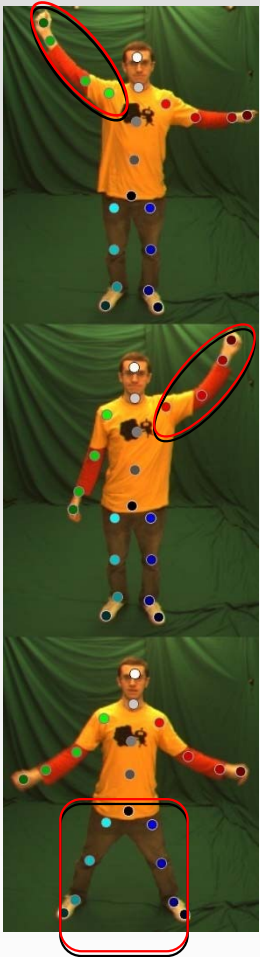
Skeleton Matching - Segmentation



Target Skeleton

Algorithm Overview

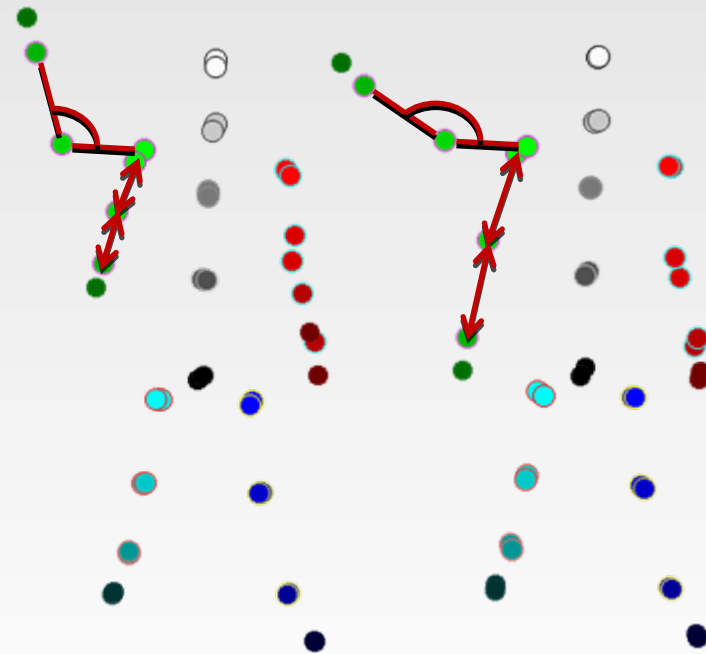
Skeleton Matching - Segmentation - Bodypart selection - Bodypart fusing



Target Skeleton

2D Skeleton Matching

- ‘Articulated Video Sprites’ [Vanaken et al, 2006]
- ~~(Absolute) positions of skeleton joints~~
- Angles
 - 2D posture
- Limb Length Ratios
 - Implicit 3D information



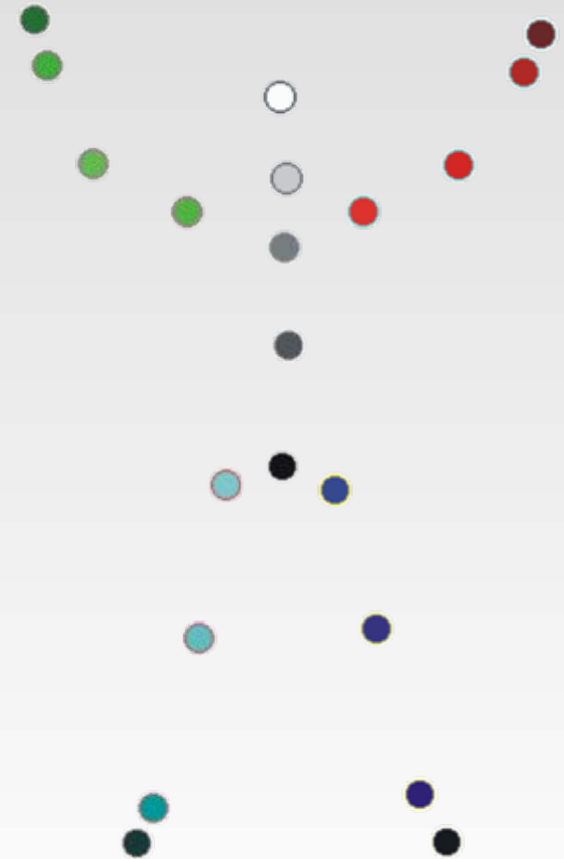
Segmentation

- Background images available
 - Background subtraction
- Manual segmentation
- Semi-automatic
 - Grabcut [Rother et. al]
 - ...



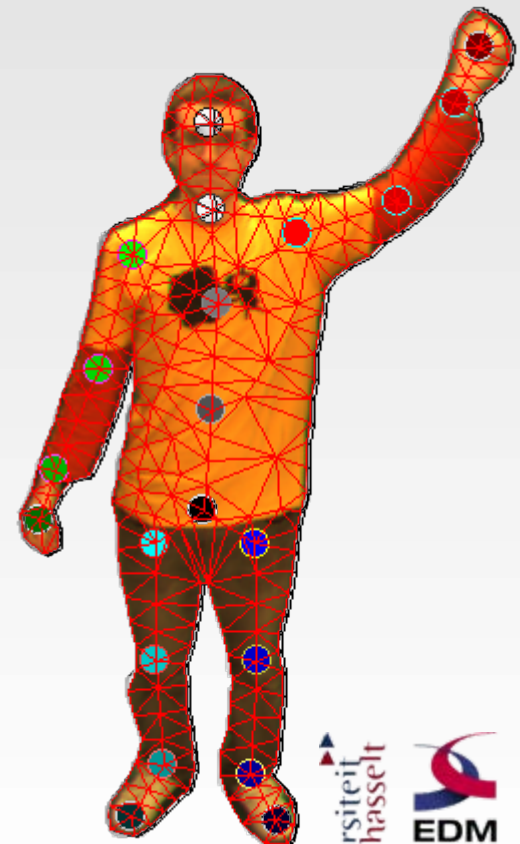
Body Part Selection

- Divide 'body'
- For each body part
 - 2D skeleton matching
 - Keep best match
- If no unique best match
 - Keep all 'good' options
 - Combine in later stage



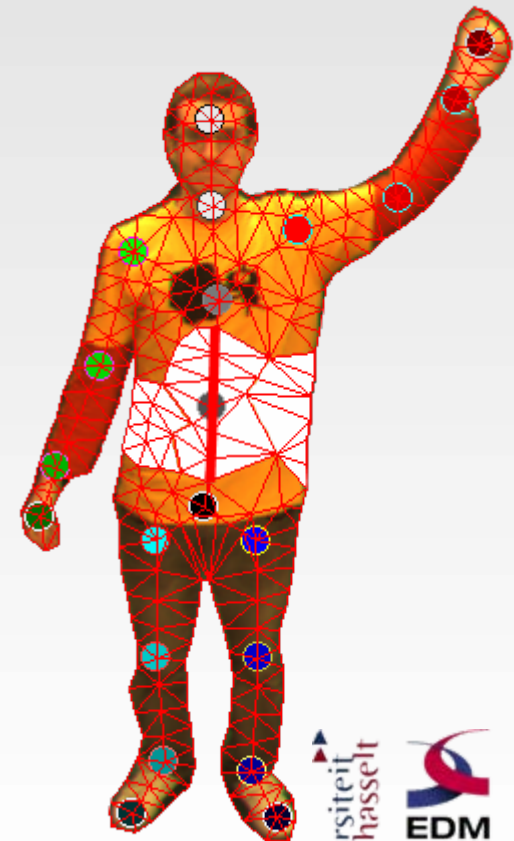
Mesh Creation

- Link skeleton with pixels
- Outer vertices → silhouette
- Inner vertices
 - Skeleton + edge image
- Mesh deformation
 - Larger variety for target poses



Pixel selection

- Link body parts with triangles
- Every triangle
 - ‘confidently’ belongs to body part if
 - Vertex on skeleton bone
 - 2 closest skeleton bones belong to same body part
 - Otherwise ‘uncertain’
- For each matching body part
 - Save ‘confident’ triangles to result
 - *Fuse* with ‘uncertain’ triangles



Fusing Body parts

- What we have until now :



- Fuse this into a nice result

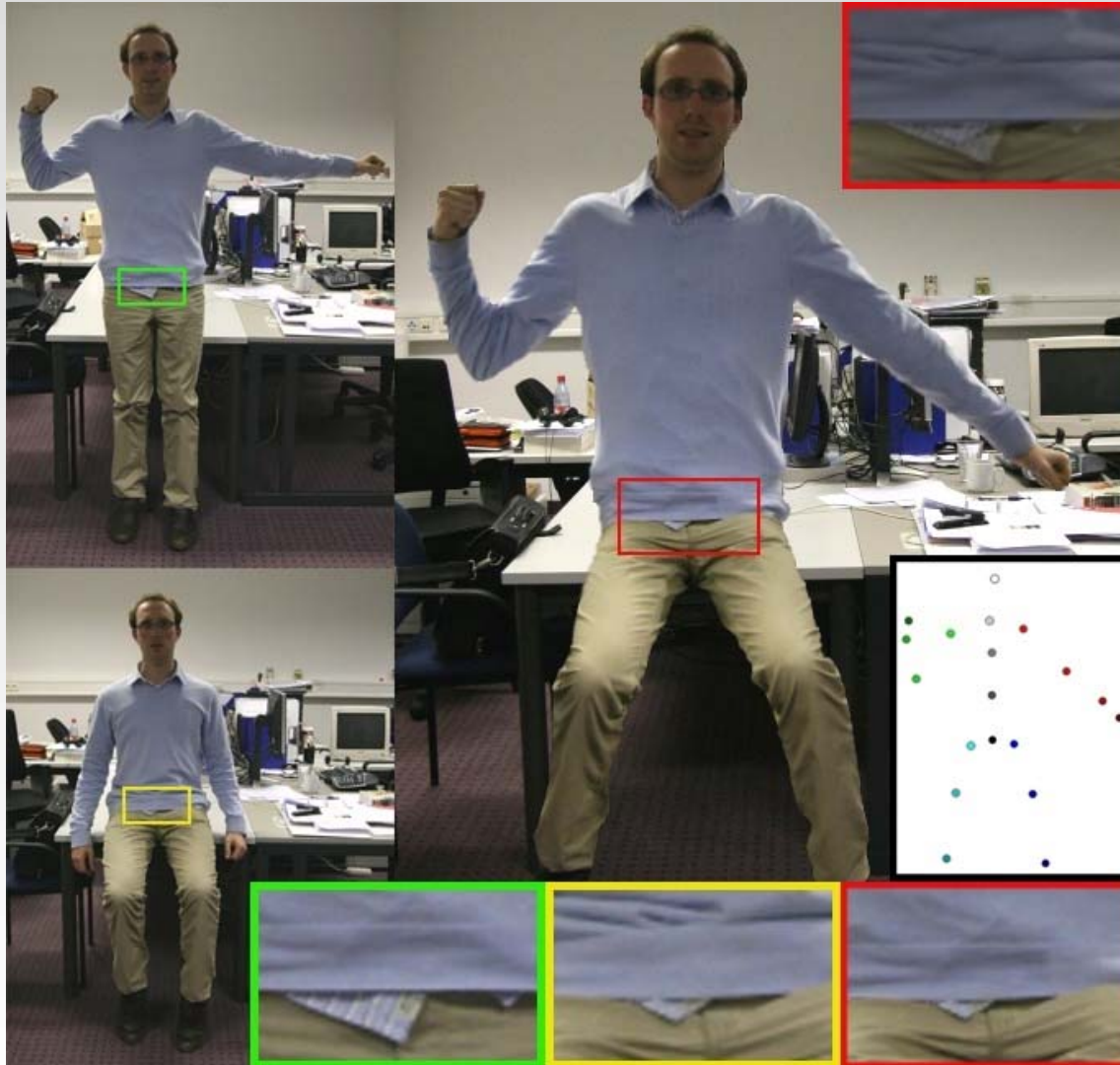
Fusing Body parts

- Subdivide final image
 - Lattice of square patches
- For each patch
 - Find input patches matching ‘confident’ regions
- == Labeling problem
 - For each patch, n input patches available
(n == #overlapping ‘uncertain’ regions)

Fusing Body parts

- Cost function
- Data term
 - Patch overlap with ‘confident’ regions
- Smoothness term
 - Patch overlap with adjacent patches
- SSD
- Minimize function → Belief Propagation

Results



Average of
input 1 & input 2

Input 1

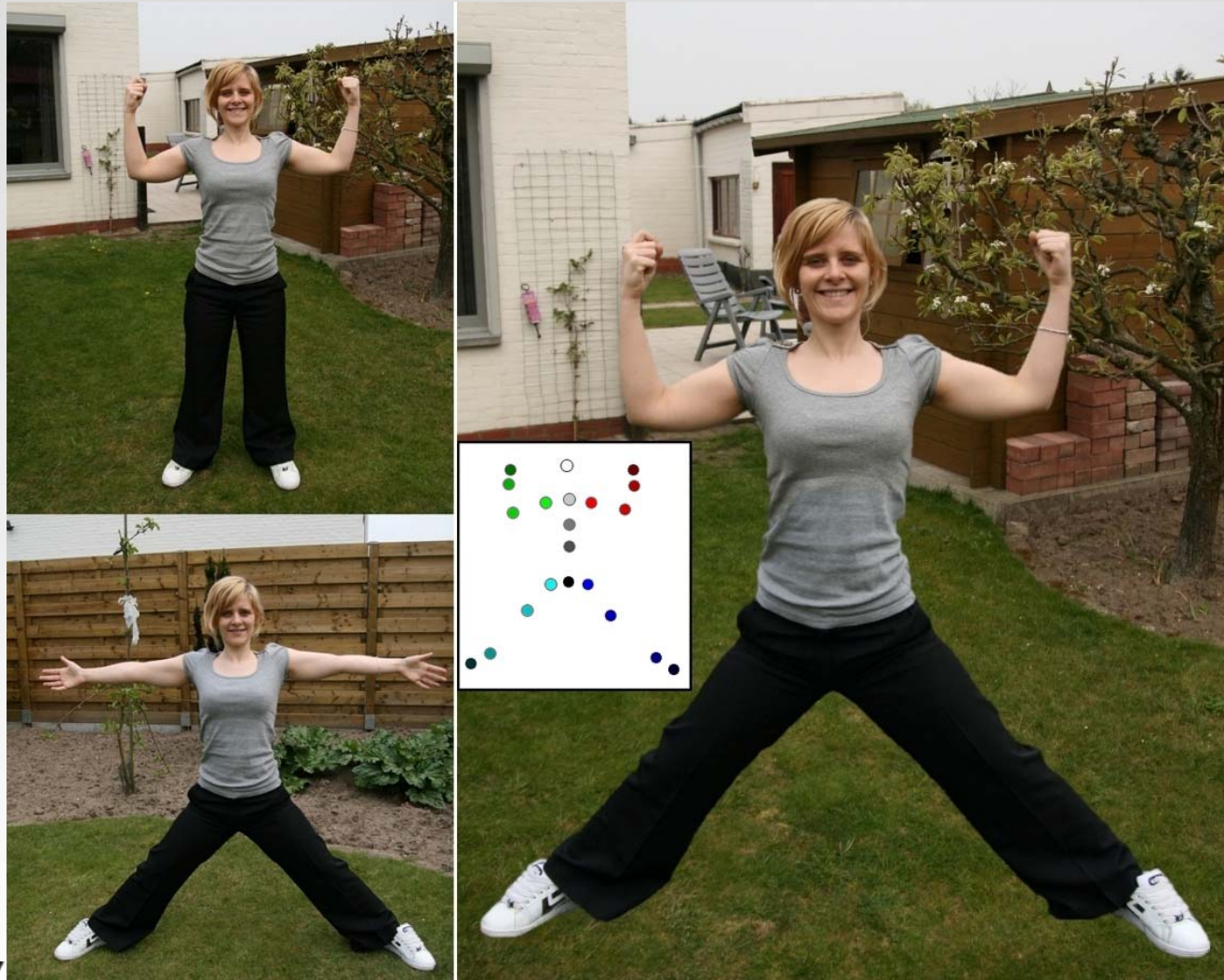
Input 2

Result

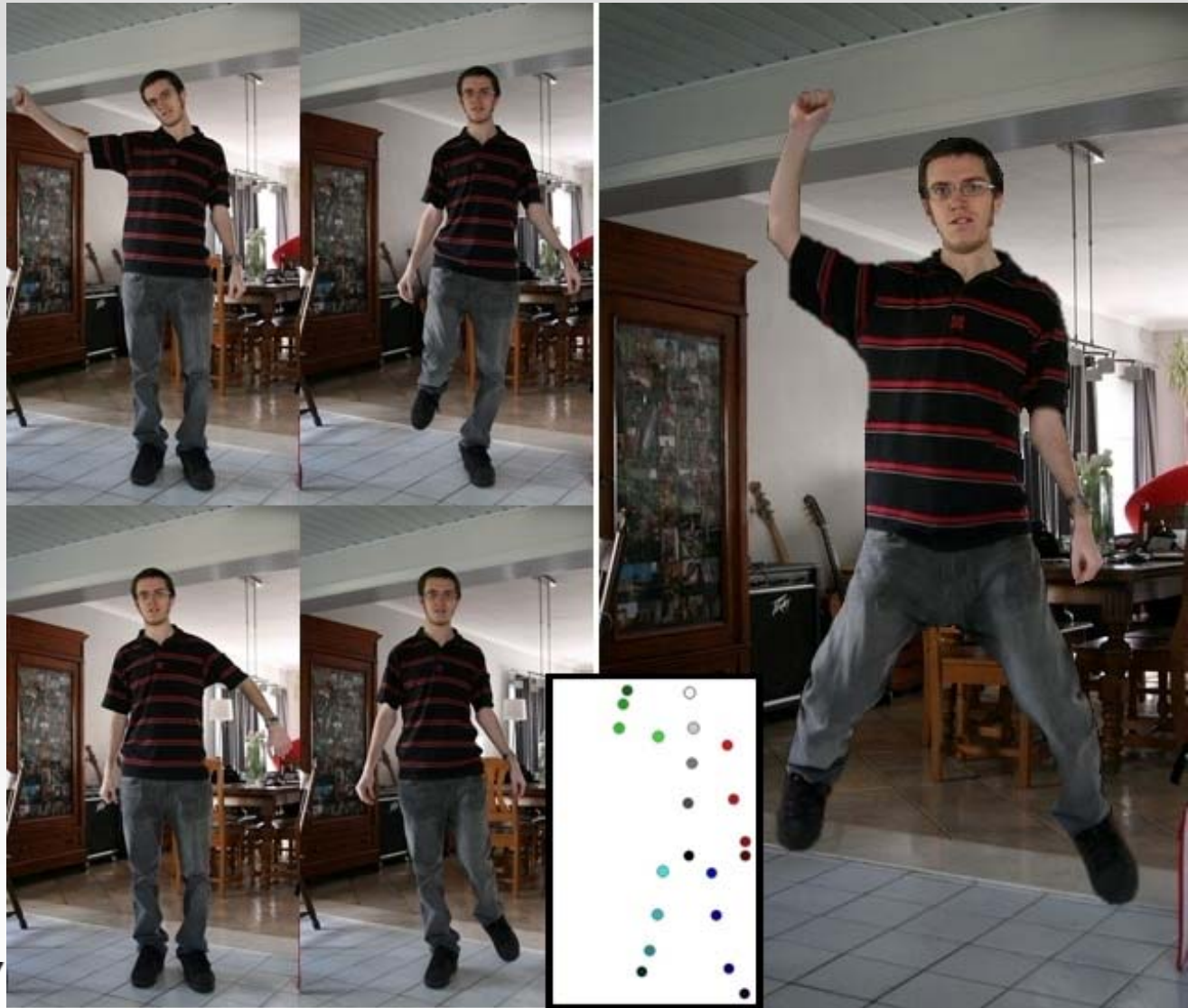
Results



Results



Results



Results



Starpulse Supermodels image gallery.
<http://www.starpulse.com/supermodels/>

Overview

- Pose synthesis from set of photographs
- Merging body parts into desired pose
- User input : 2D skeletons



Future Work

- Automatic skeleton extraction
- Combine with animation/retargeting
- Occluding body parts
- Sideways capture
- 3D skeletons / multi-camera
- Color correction

Questions?

