

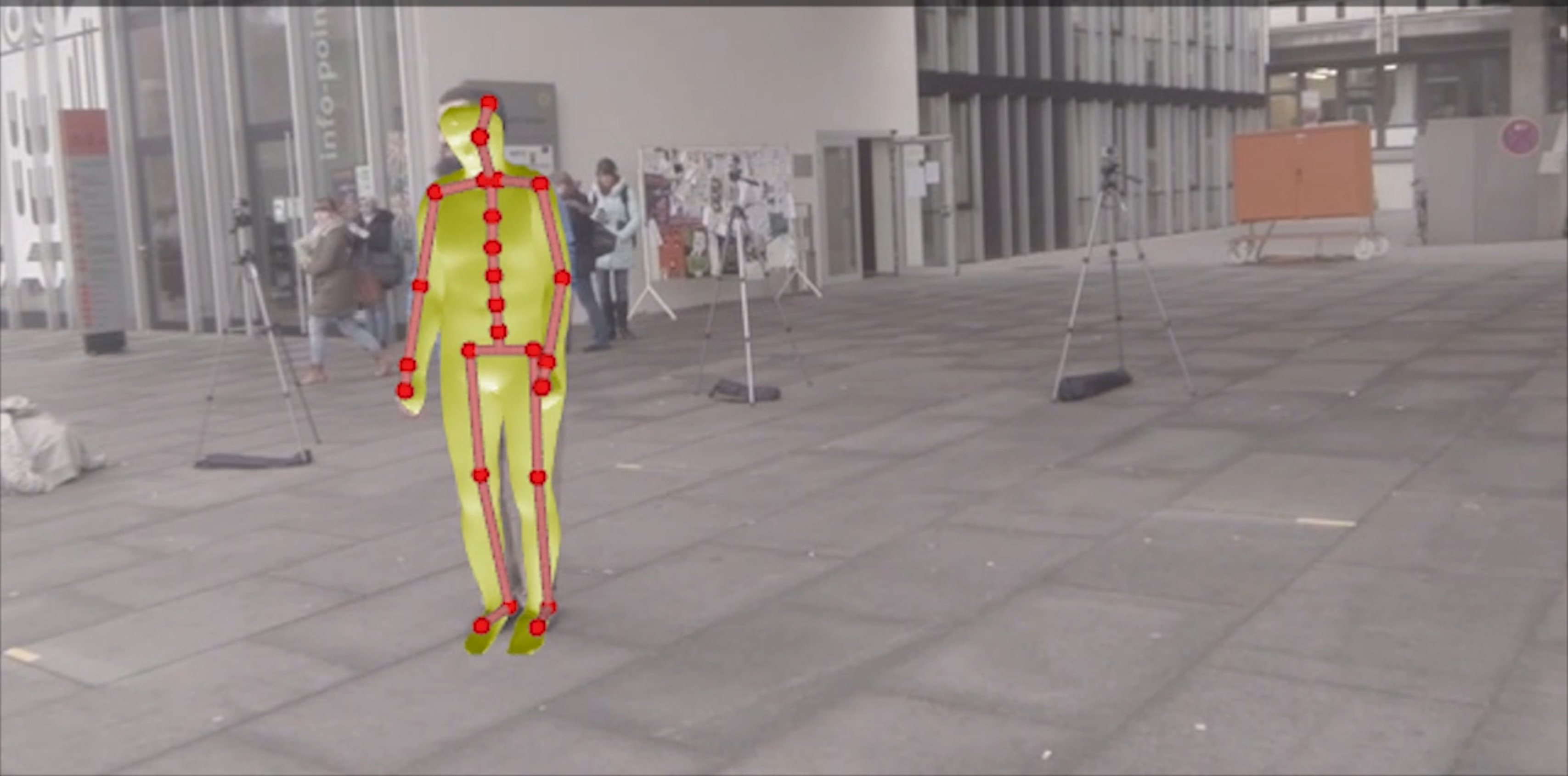
General Automatic Human Shape and Motion Capture Using Volumetric Contour Cues

ECCV 2016

Helge Rhodin, Nadia Robertini, Dan Casas,
Christian Richardt, Hans-Peter Seidel, Christian Theobalt



Automatic human shape and motion capture



Moving background



Color ambiguities



Automatic human shape and motion capture

Stage I



Multi-view Input



Body part detections



Projected skeleton



Skeleton model

Stage II



Multi-view Input

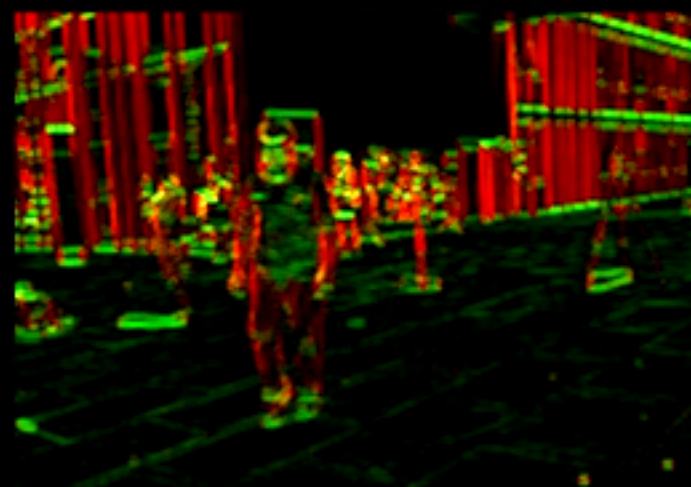


Image gradients

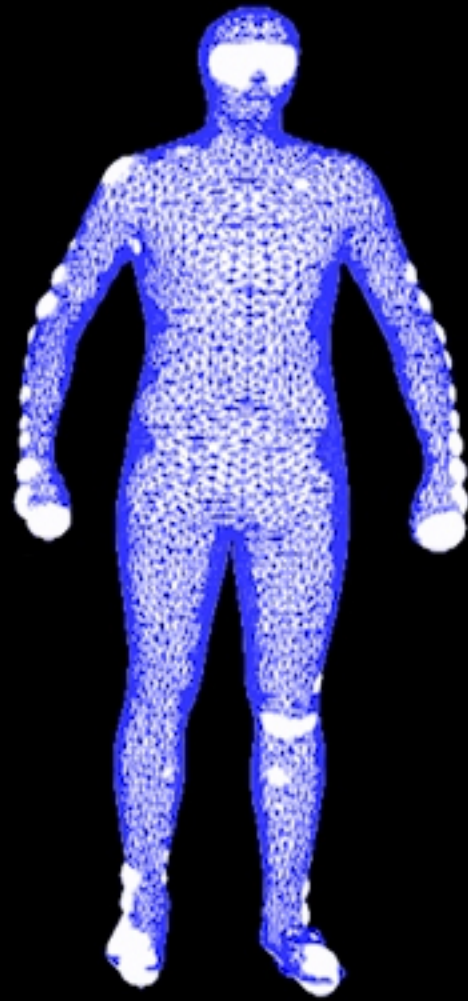


Actor contours



Volumetric model

Parametric actor model



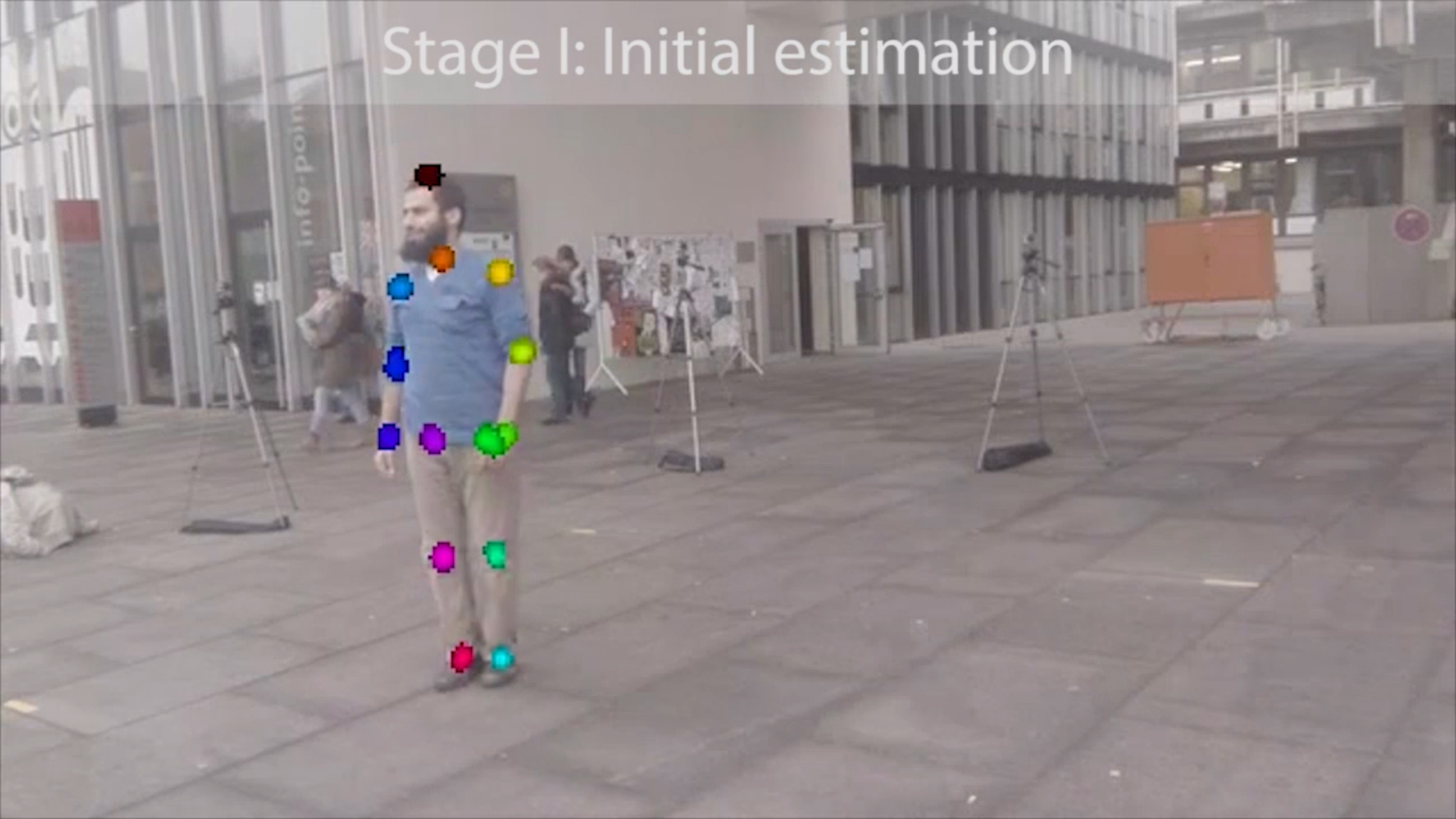
Stage I

Initial estimation

Input:
RGB images

Output:
Skeleton and motion

Stage I: Initial estimation



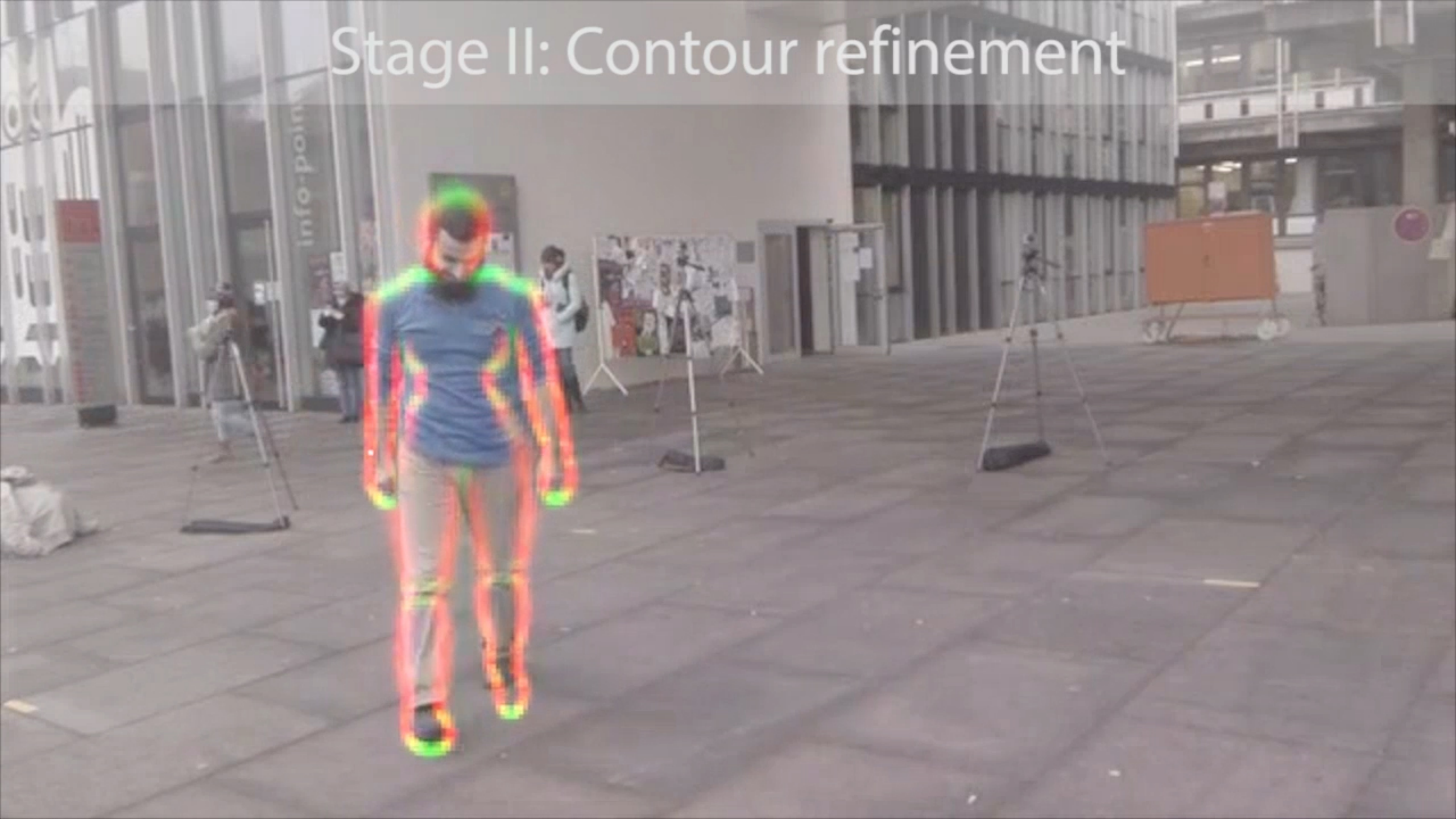
Stage II

Contour based refinement

Input:
Gradient images

Output:
Actor model

Stage II: Contour refinement



Contour Refinement

Stage I

Stage II



Contour similarity

Stage II: Output actor model



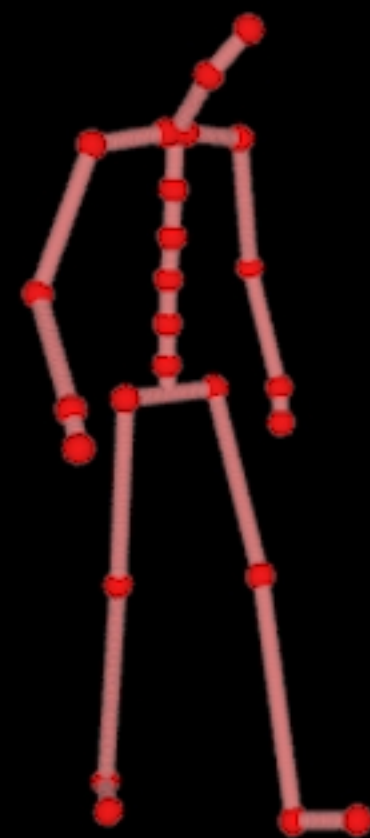
Automatic actor model



Reference
image



Colored
density



Skeleton



Mesh

Marker

Studio, two cameras
100 frames



Three camera reconstruction (Marker)

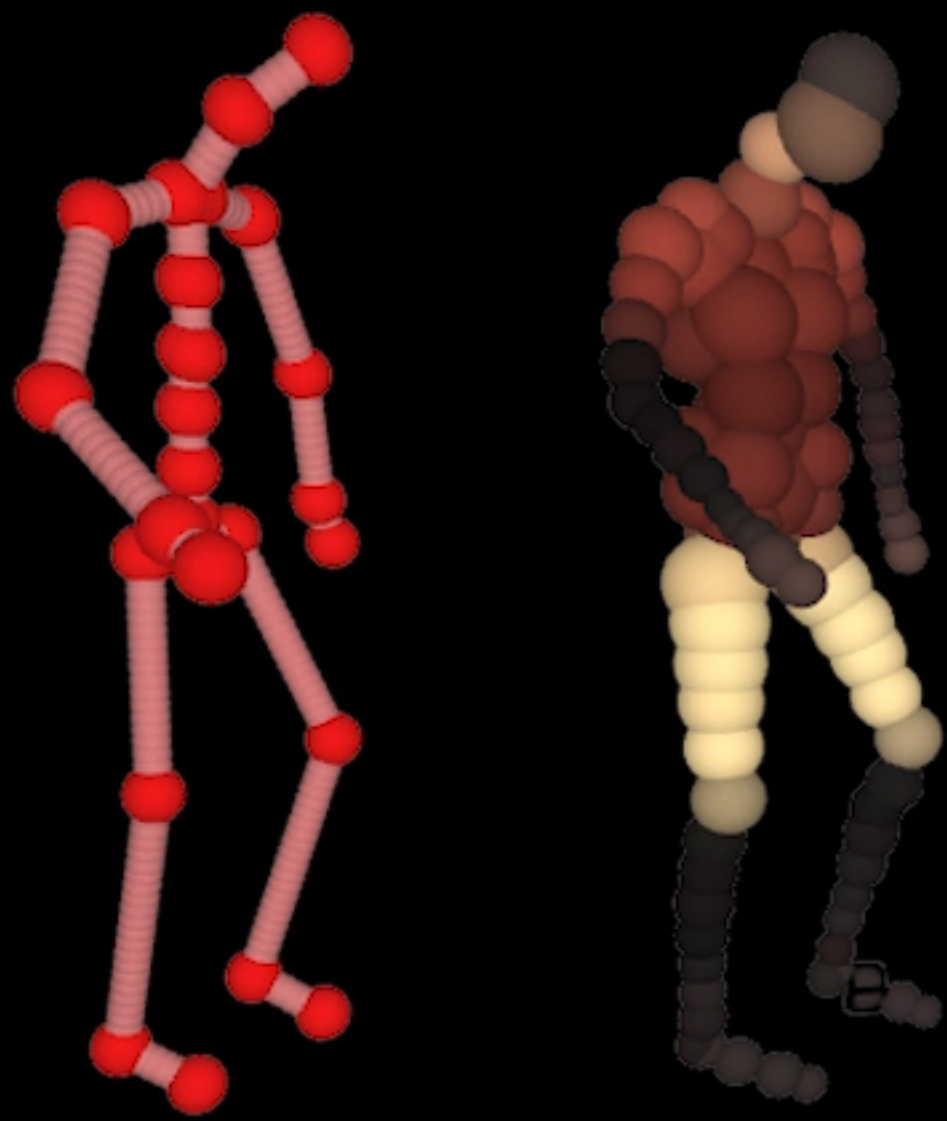


From three cameras



From two cameras

Automatic model quality



Our automatic model



Reference view

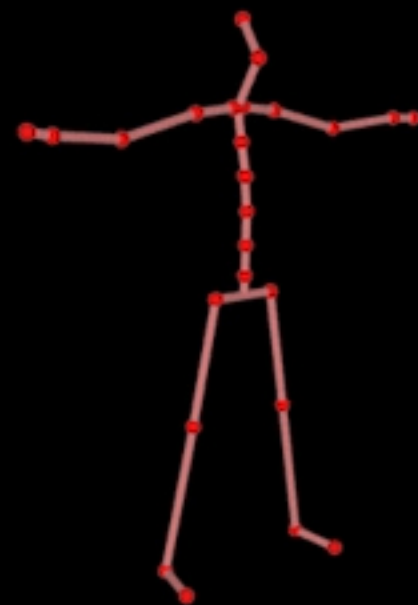
Studio

Studio, 10 cameras
2 frames

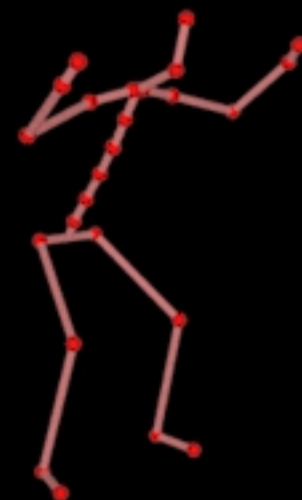


Automatic Studio actor model

Frame 1



Frame 2



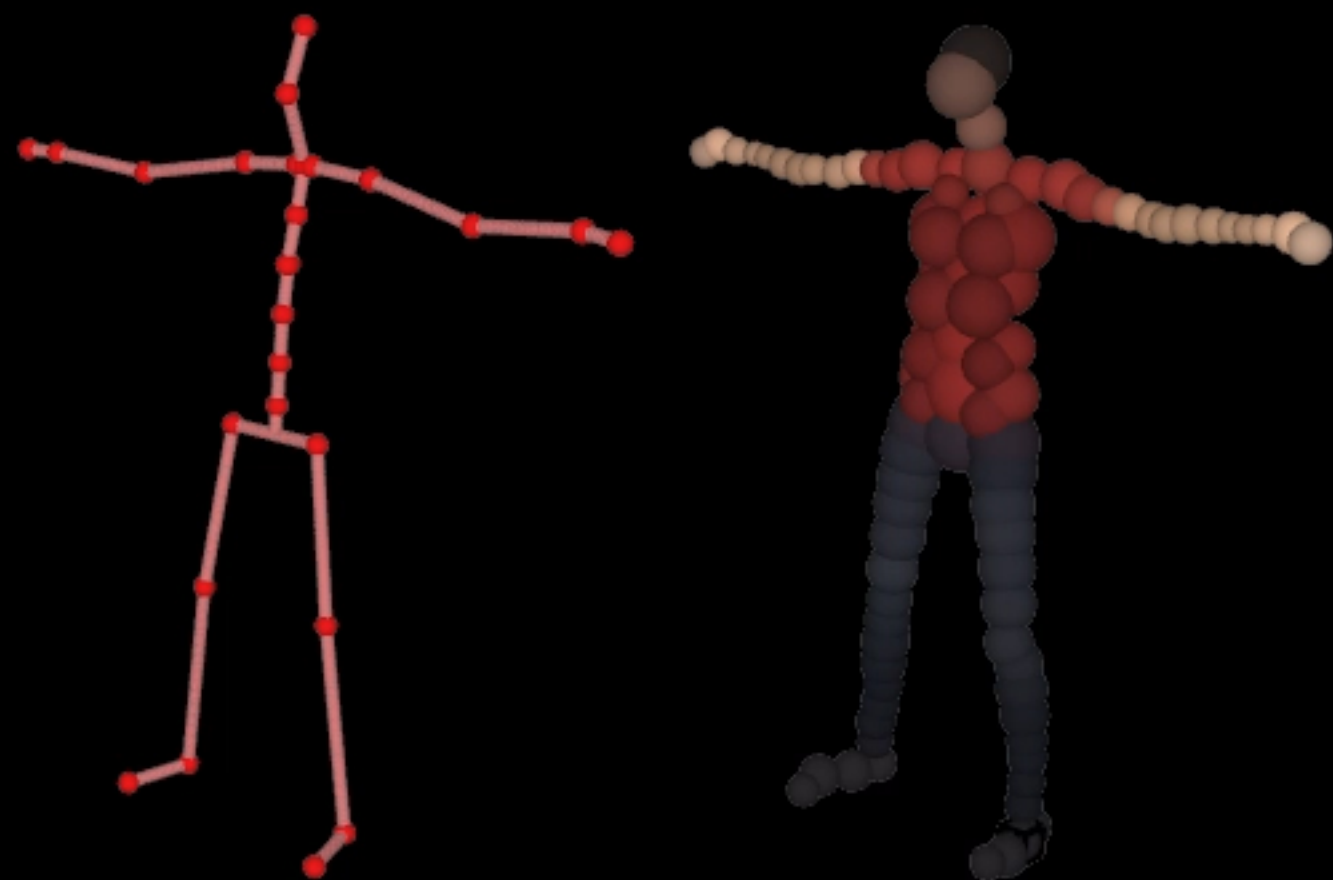
Reference
image

Colored
density

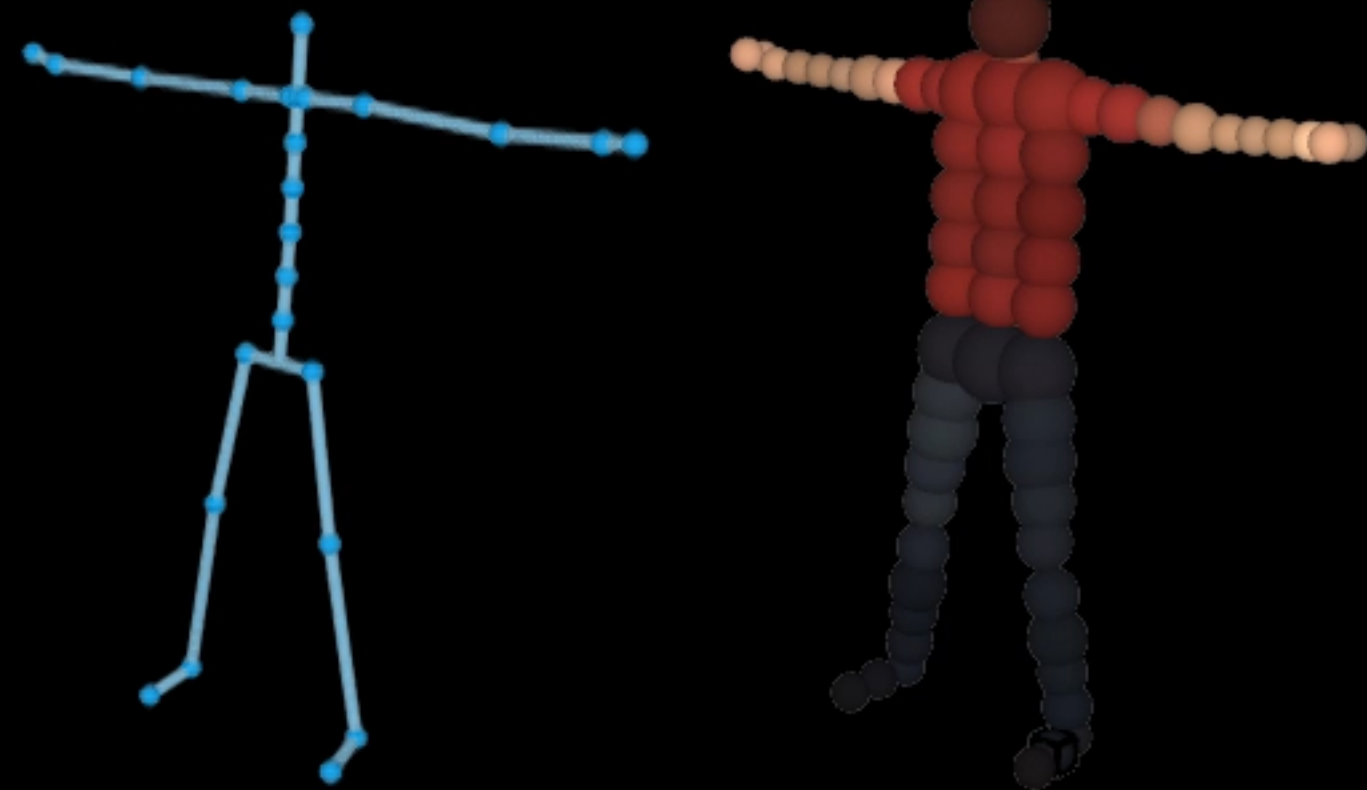
Skeleton

Mesh

Comparison to manual model



Our automatic model

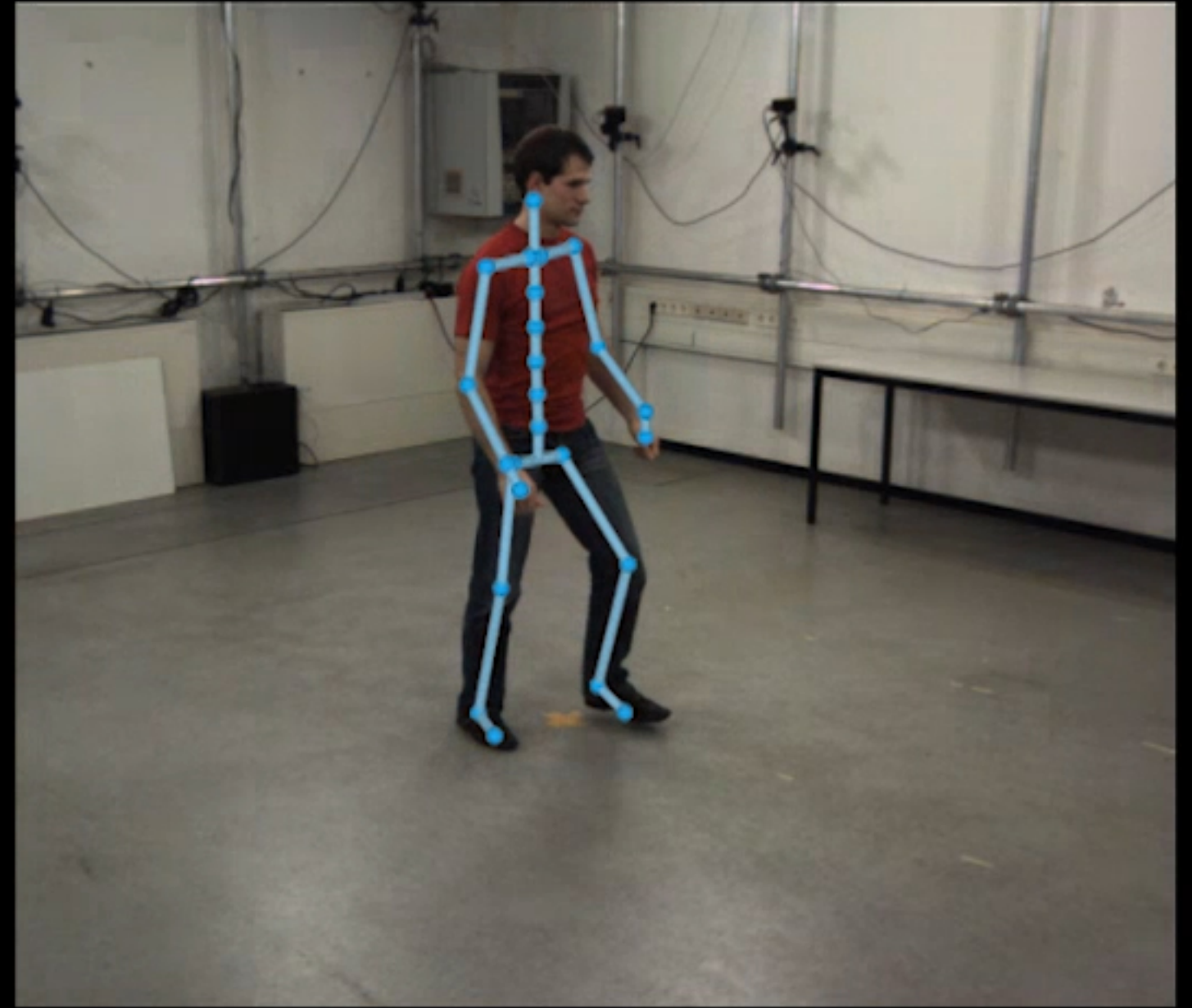


Manual model of Stoll et al.

Automatic vs. manual model (Stoll et al. ICCV2011)



Model: Automatic, our
Algorithm: Tracking, Stoll et al.



Model: Manual, Stoll et al.
Algorithm: Tracking, Stoll et al.

Subject1

Studio, low image quality, six cameras
100 frames



Space-time motion and shape estimation



Motion



Mesh

Subject 1



Mean PCA



Reconstruction



Laser scan

Subject 2



Mean PCA



Reconstruction



Laser scan

Subject 3



Mean PCA



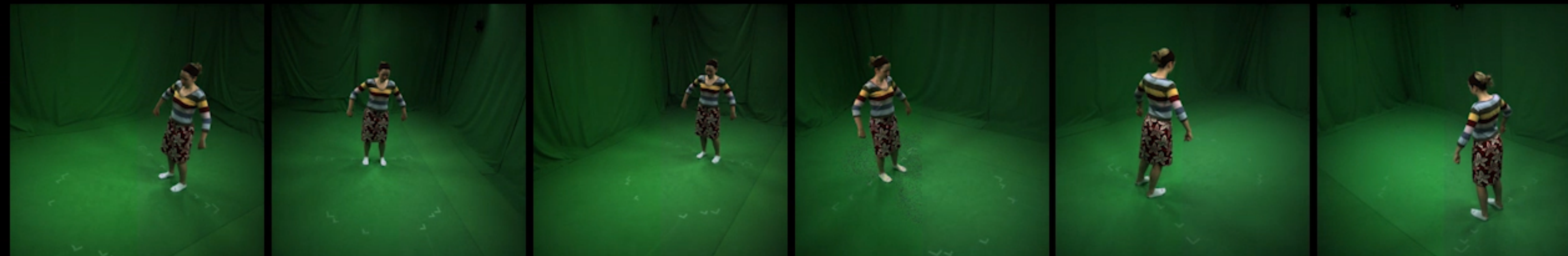
Reconstruction



Laser scan

Skirt

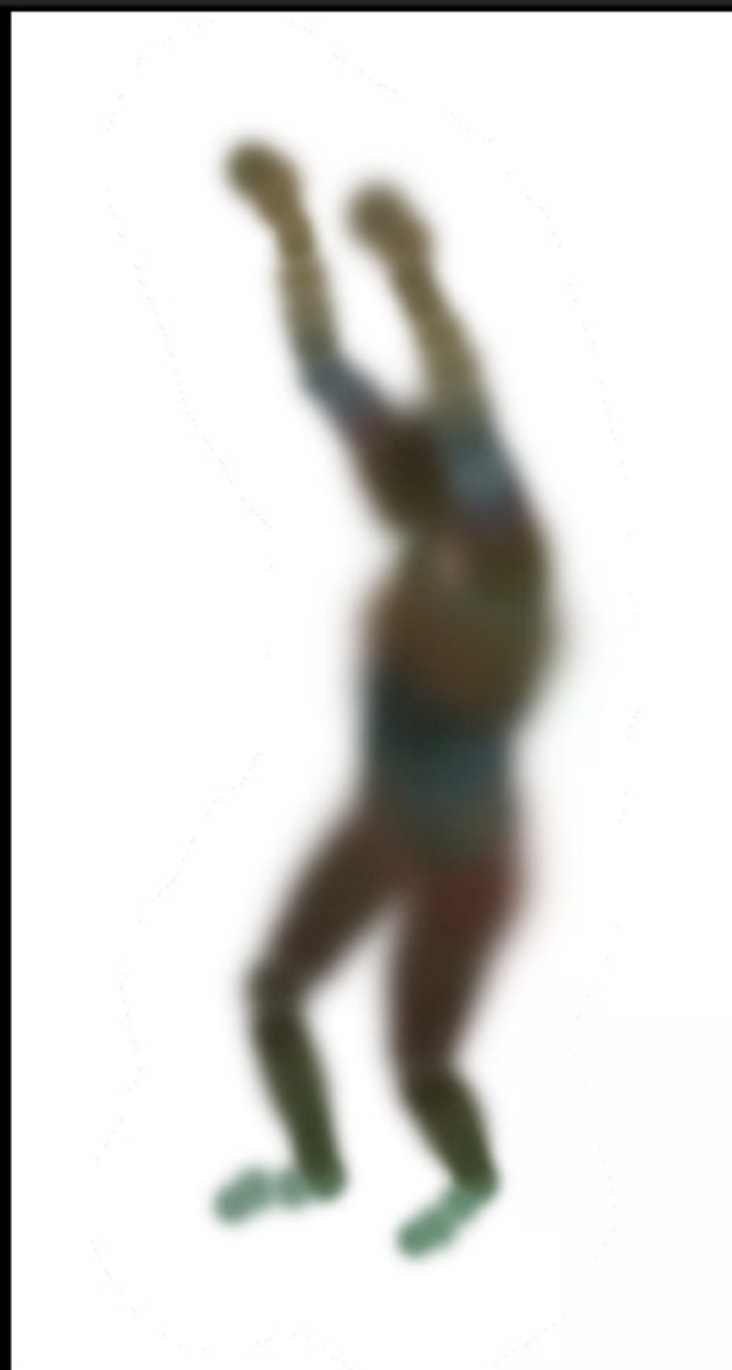
Studio, six cameras
100 frames



Automatic Skirt actor model



Reference
image



Colored
density

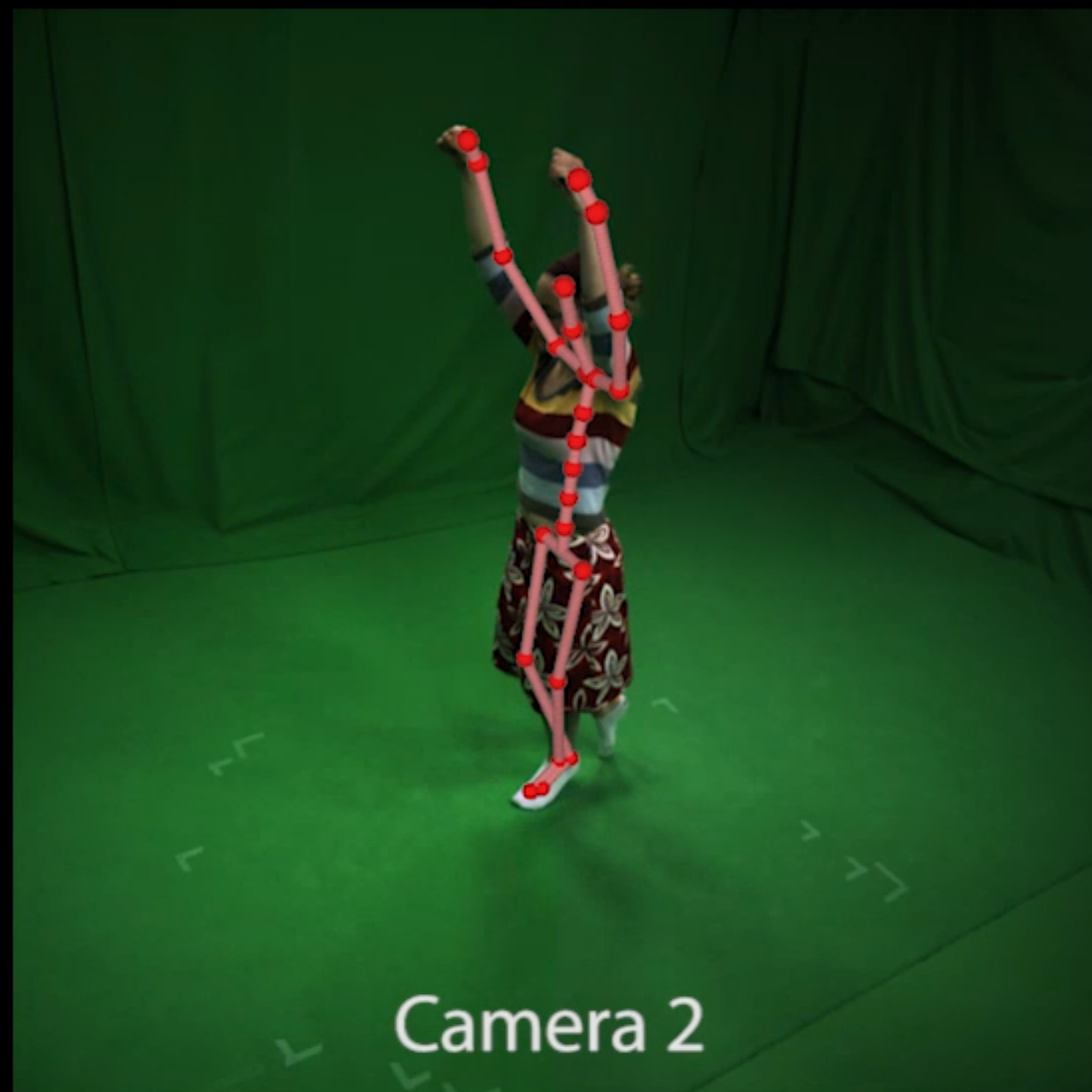
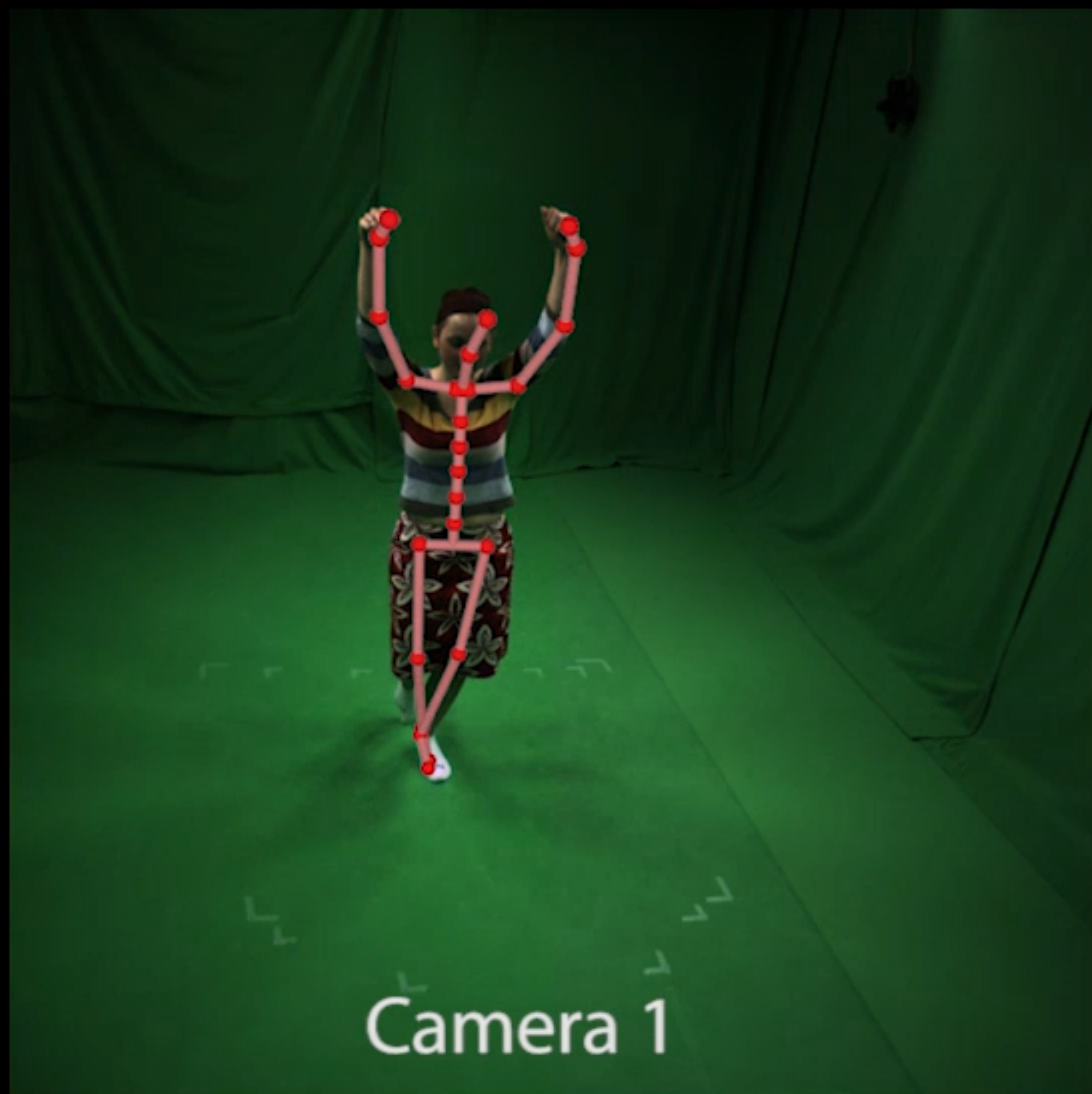


Skeleton



Mesh

Loose clothing approximation (Skirt)



Subject 3

Outdoor, three cameras
100 frames



Outdoor, three cameras (Subject 3)



Camera1



Camera2



Camera3

Cathedral-falling

Outdoor, four cameras
20 frames

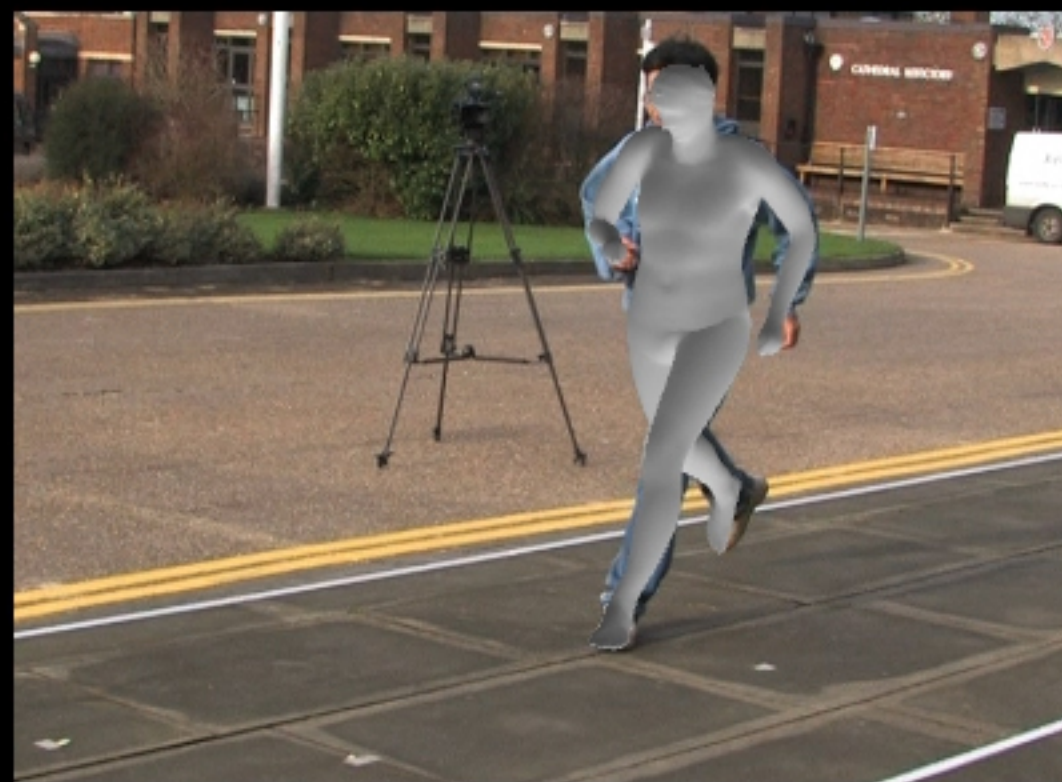


Outdoor, four cameras

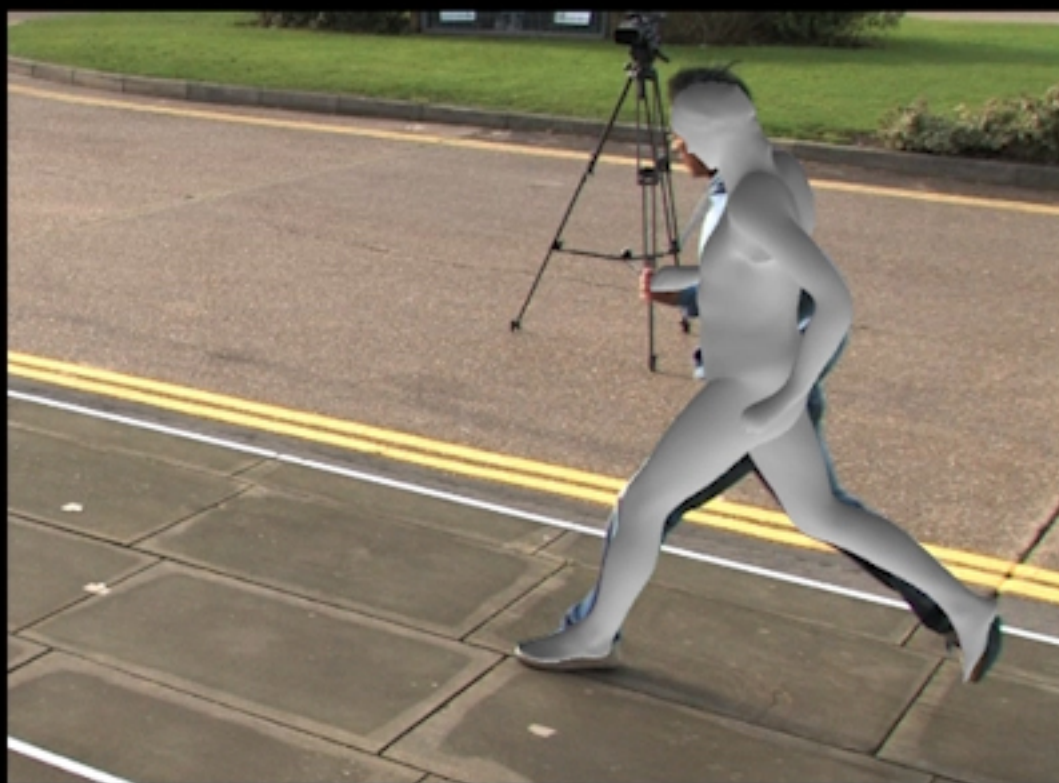
Camera 1



Camera 2



Camera 3



Camera 4



Comparison to model free reconstruction



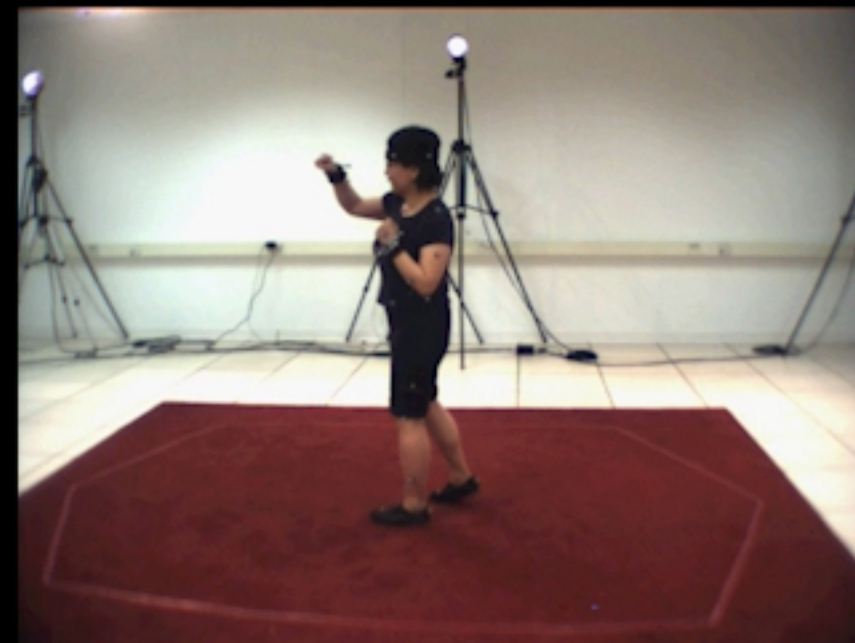
Our



Mustafa et al. ICCV 2015
(automatic, model free)

HumanEva-Box

Studio, 3 cameras
382 frames



Stage I

Stage II

Overlap
(qualitative)



Overlap
(quantitative)



Recall: 83.42%
Precision: 90.73%

Recall: 88.69%
Precision: 95.40%

Automatic human shape and motion capture

Contributions

- Fully automatic shape and pose
- Reconstruction in general scenes
- Parametric shape model
- Volumetric contour cues
- Space-time optimization



Body part detections



Projected skeleton



Skeleton model

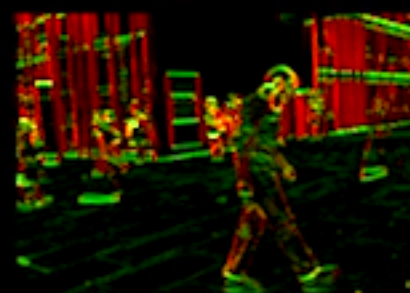


Image gradients



Actor contours



Volumetric model



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