

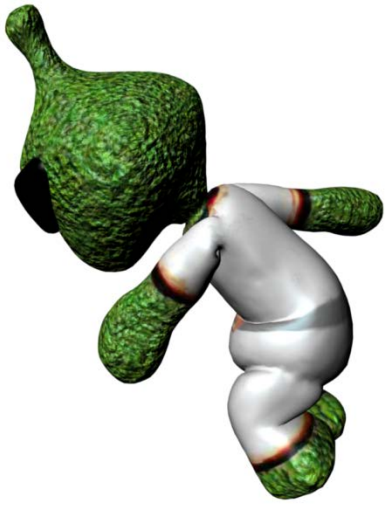

ArtiSketch: A System for Articulated Sketch Modeling

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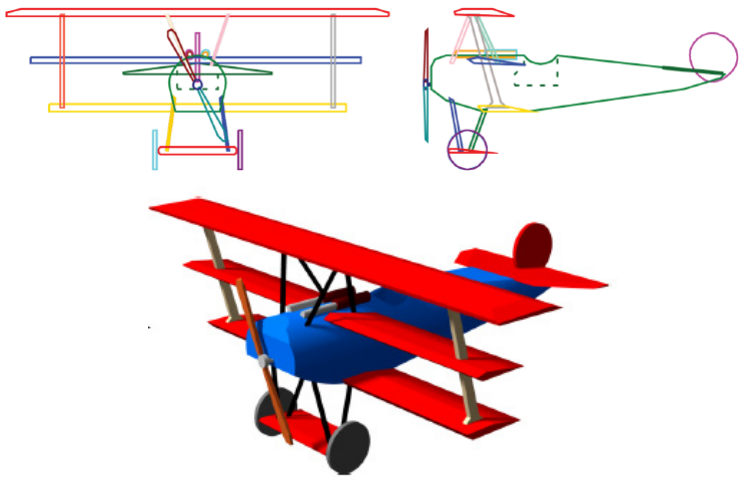
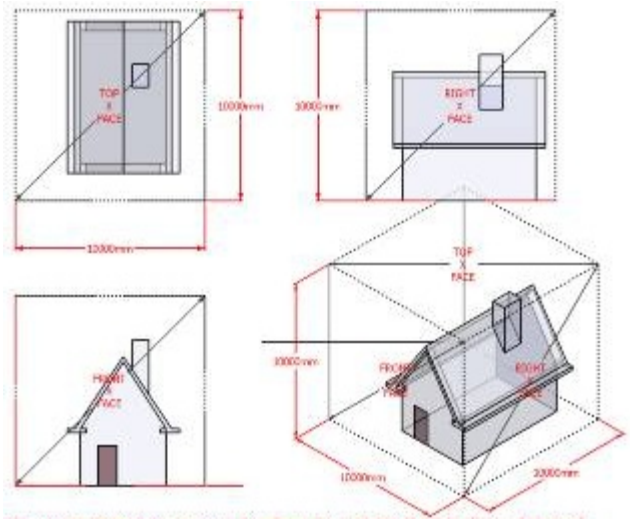
Sketch-Based Modeling

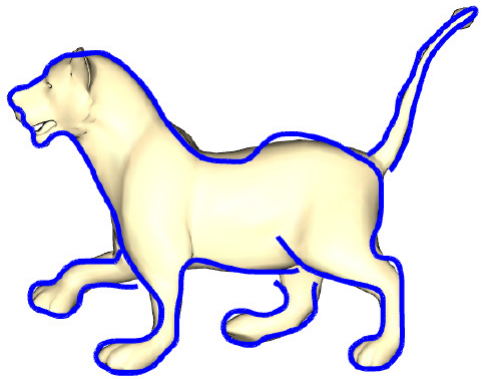
- Previous work:
  - 2D interaction (Teddy [Igarashi et al. 1999])
  - Predetermined views (orthographic)
  - Rigid object



Rivers et al. 2010



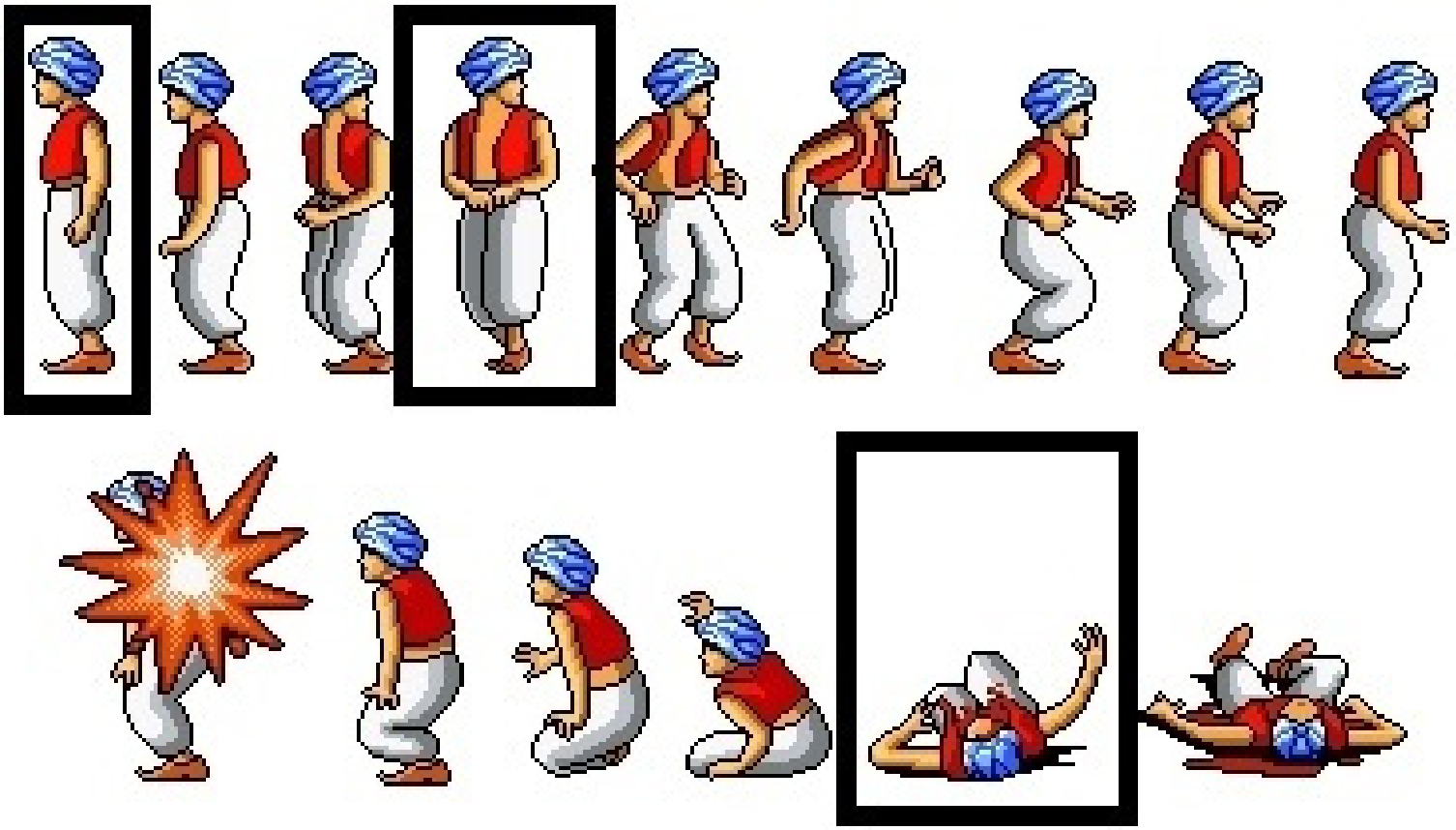
Google SketchUp



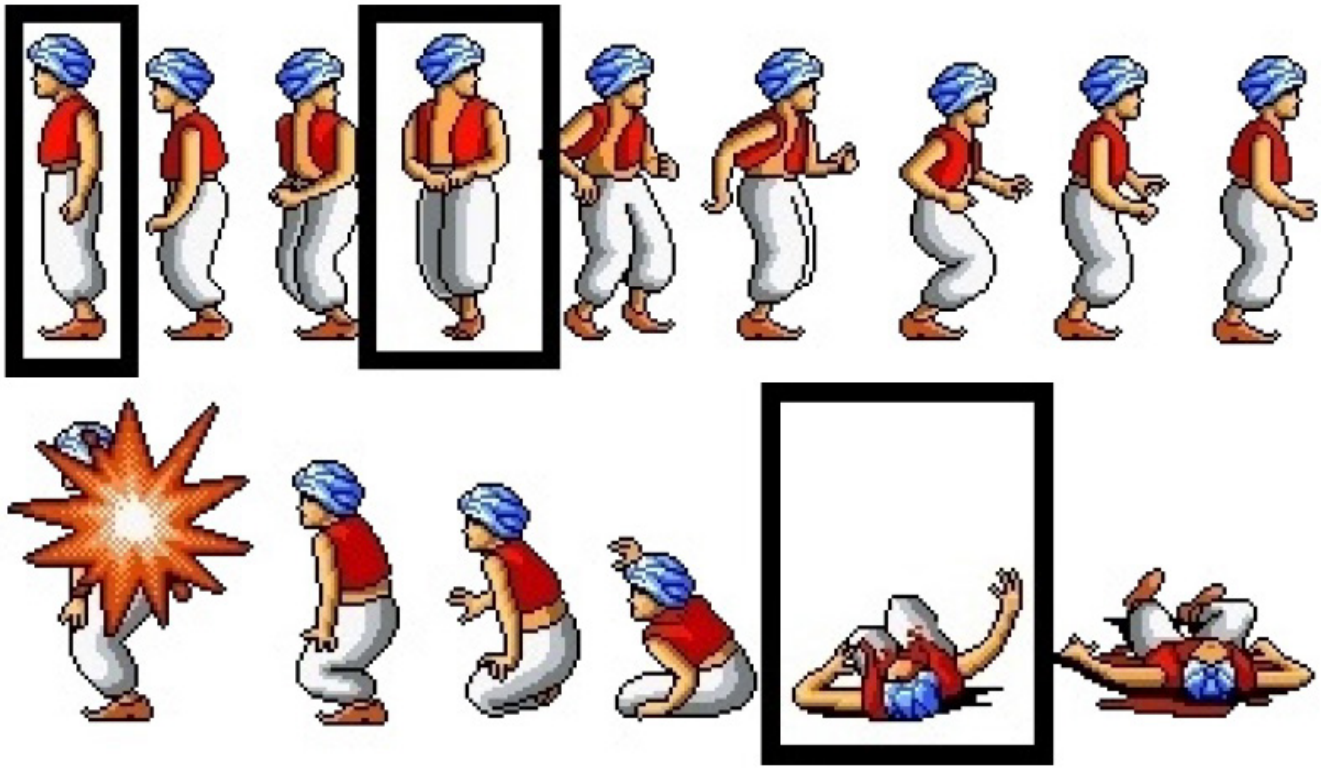
Kraevoy et al. 2009

Objective

- Exploit 2D articulated content (e.g. cartoon animations and sprites)

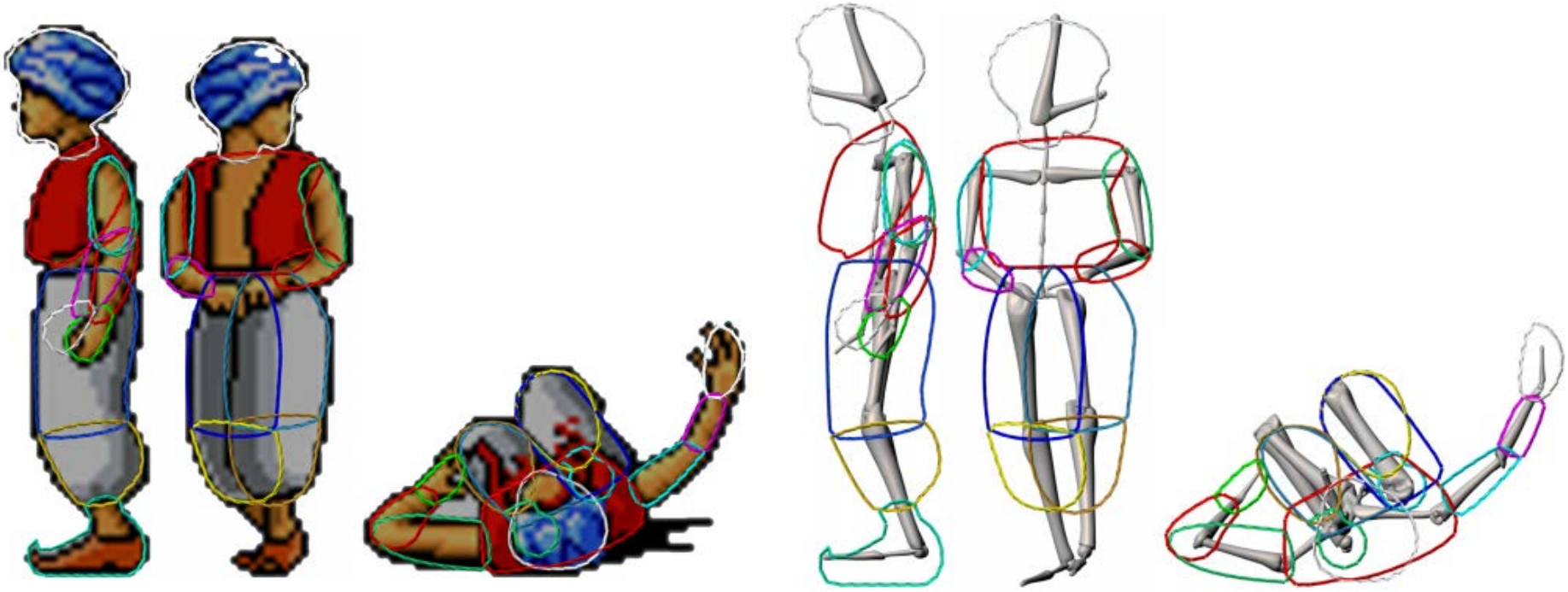


- Assumptions:
  - Articulated content (piecewise rigid)
  - The animation “imitates real-life”
- What is missing?



The Skeleton

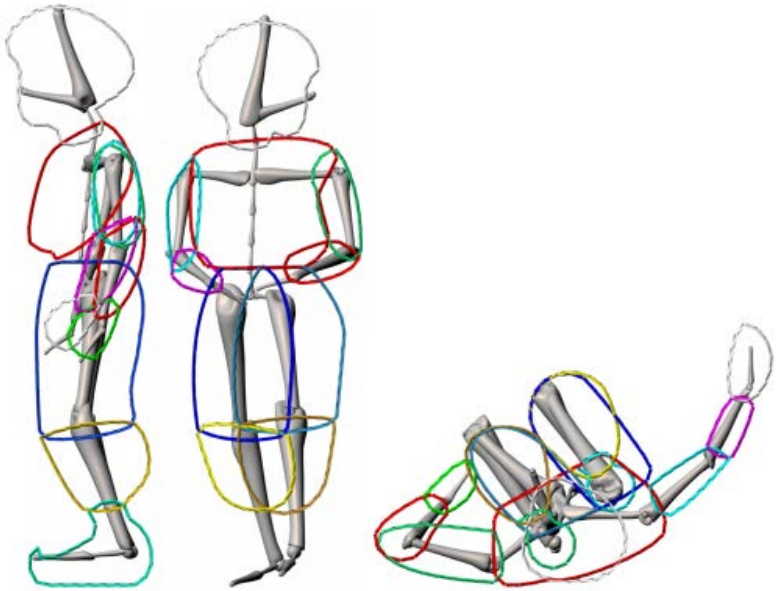
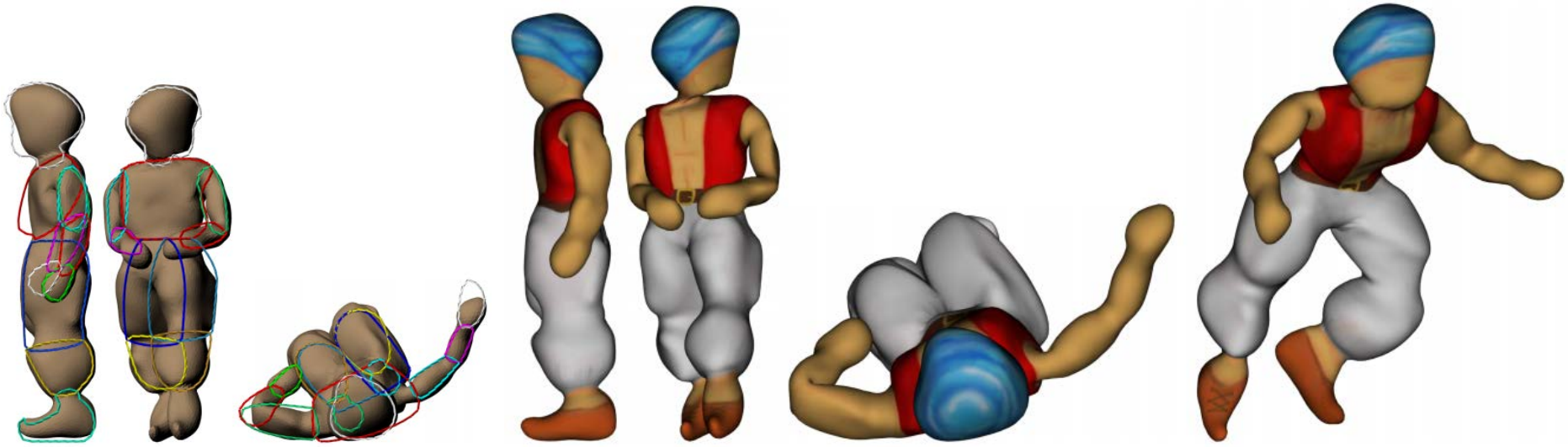
- **Missing information:** camera transforms
- **Can the user supply somehow the missing info?** 3D skeleton!



A New Problem

- **Input:**
  - A set of F sketches
  - A skeleton in F (initial) poses
  - Correspondence

- **Output:**
  - Triangle mesh
  - Silhouettes of LBS fit sketch

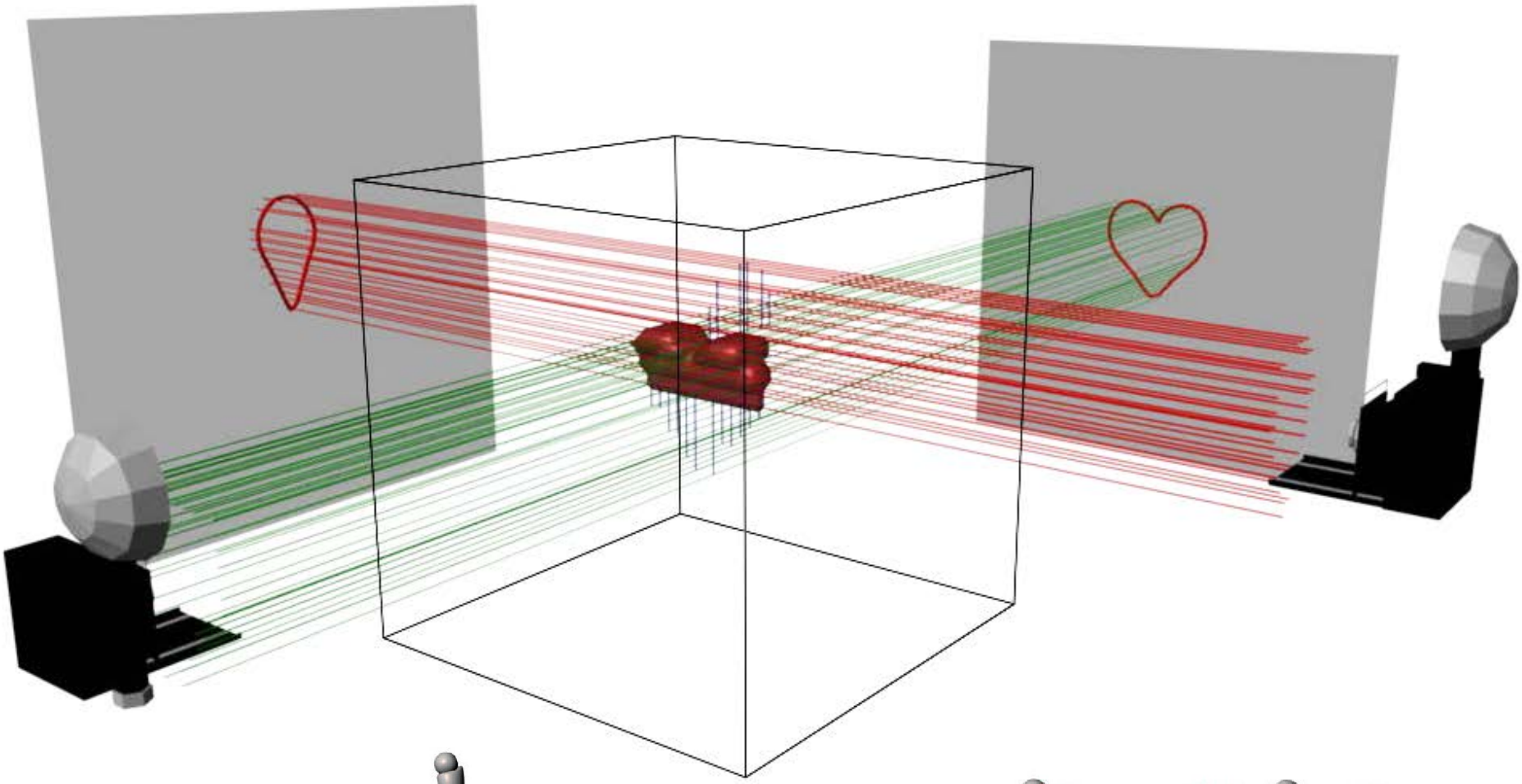




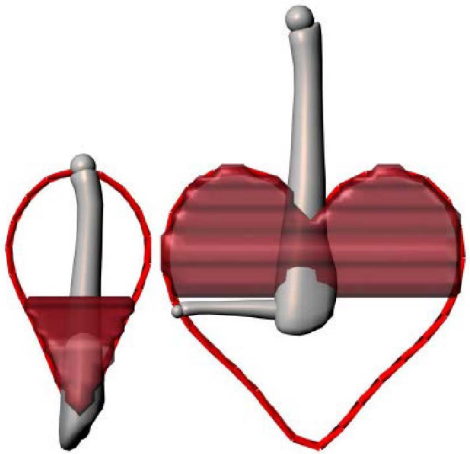
System Outline

- **Camera calibration**
- **Surface reconstruction**
- **Volume reduction**
- **Parts consolidation**

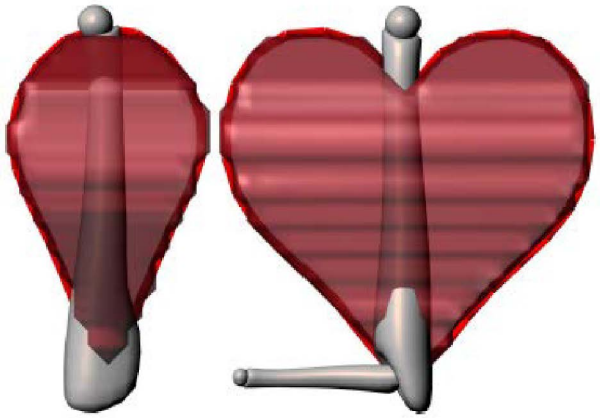
Camera Calibration

- The user can’t be trusted!
- Objective: Maximize consistency between shape silhouette and sketch contour
- Voxel grid for visual hull carving (discretize camera rays)
- Camera transform = joint inverse transform



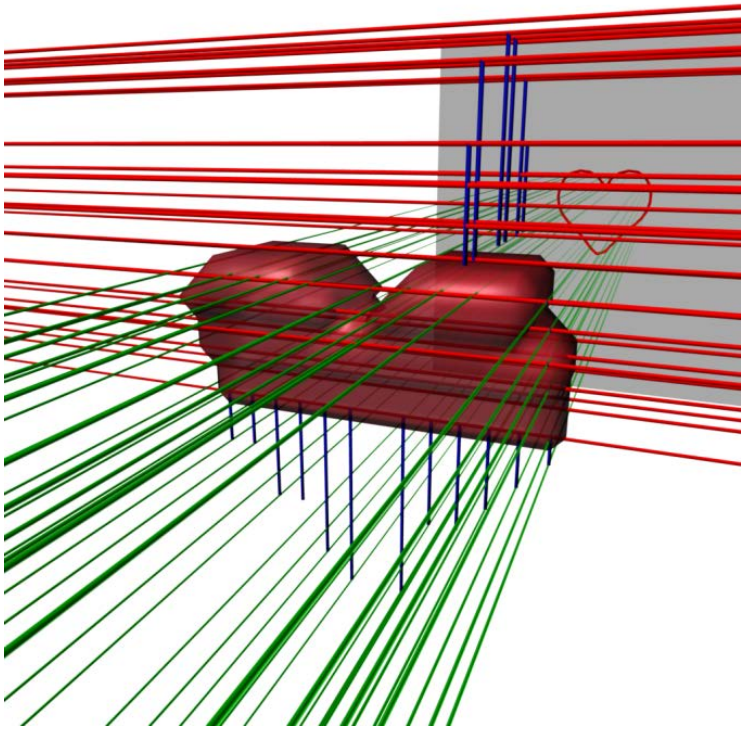


Before



After

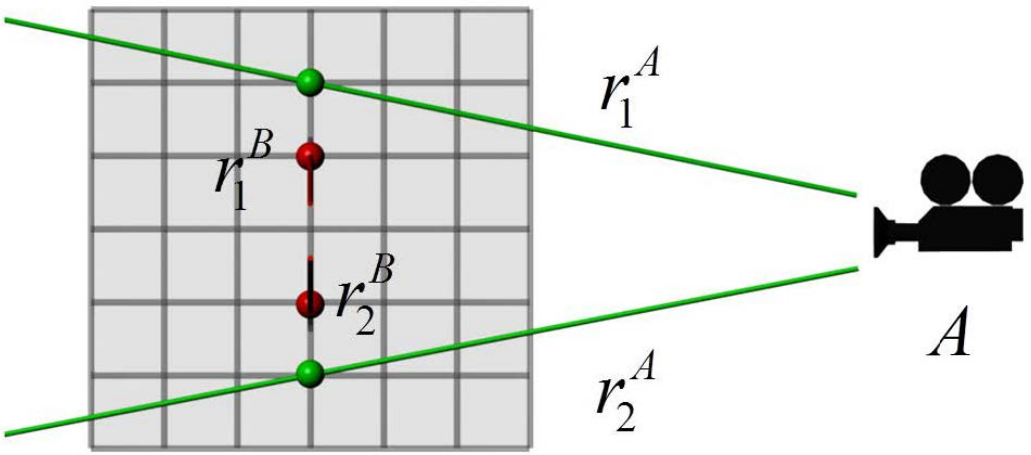
ICP-Based Approach



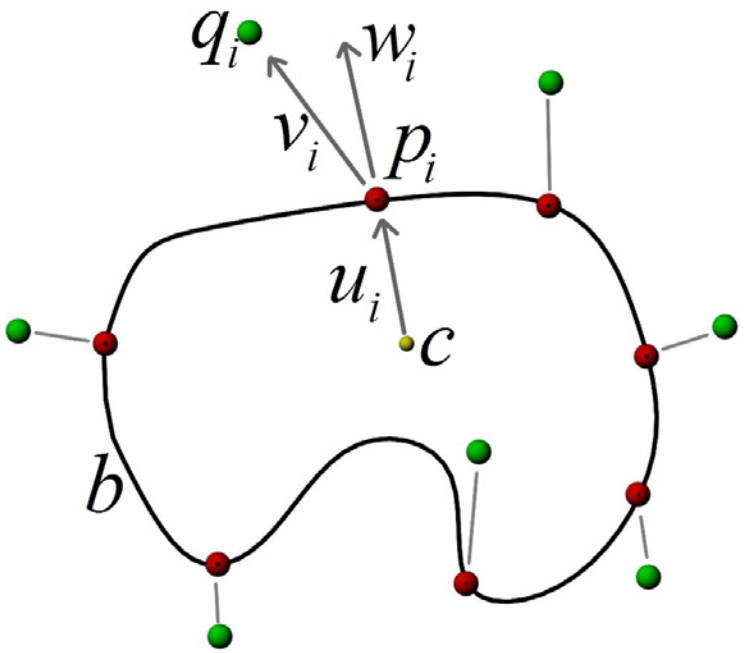
- Previous algorithms:

  texture, epipolar geometry
- Objective: Minimize Hausdorff distance between rays
- ICP iteration
  - Find correspondences between A-rays and B-rays
  - Optimize camera transformation

- Generalize: full skeleton, multiple cameras
- Perspective camera: camera dolly step

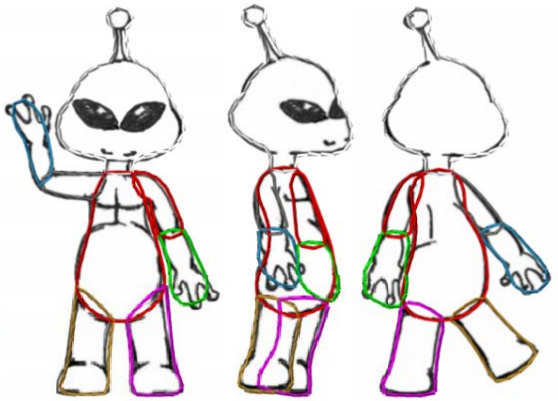


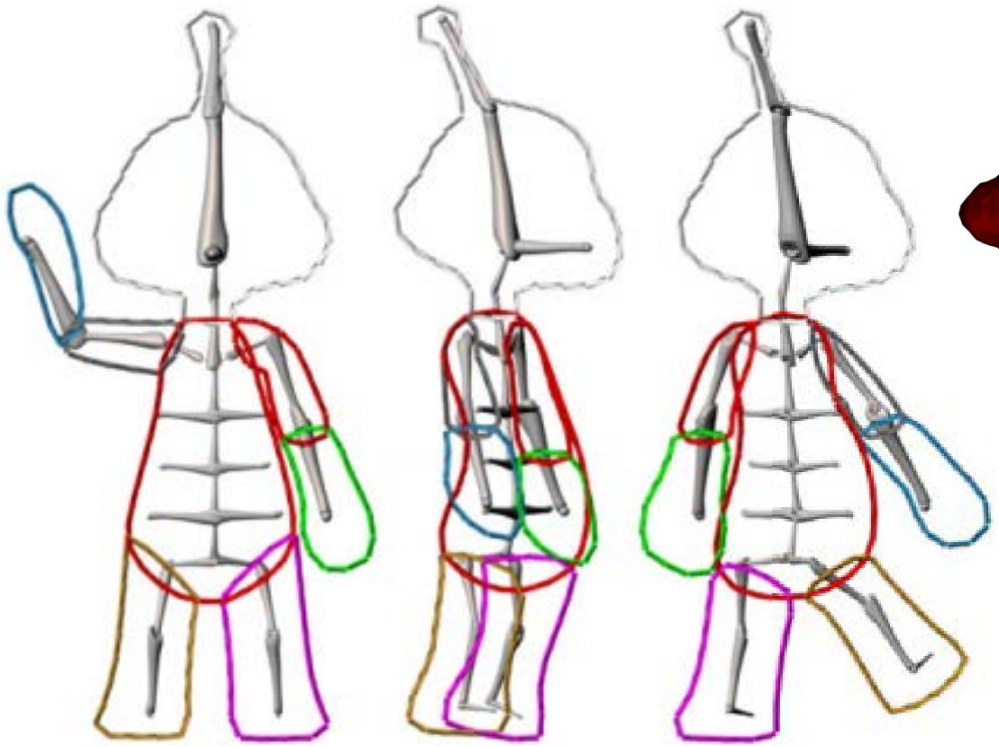
Camera B view



Surface Reconstruction

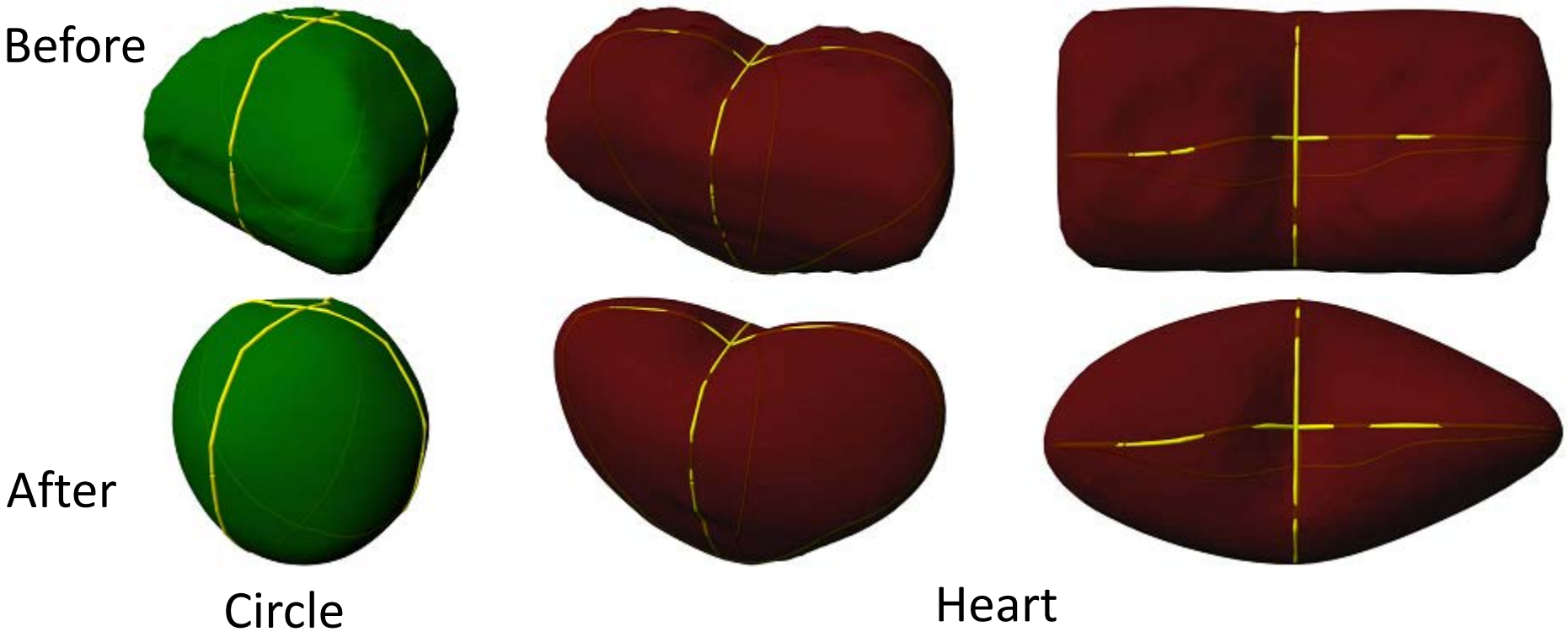
- LSM:
  - Chan-Vese, GAC, GVF, OMG…



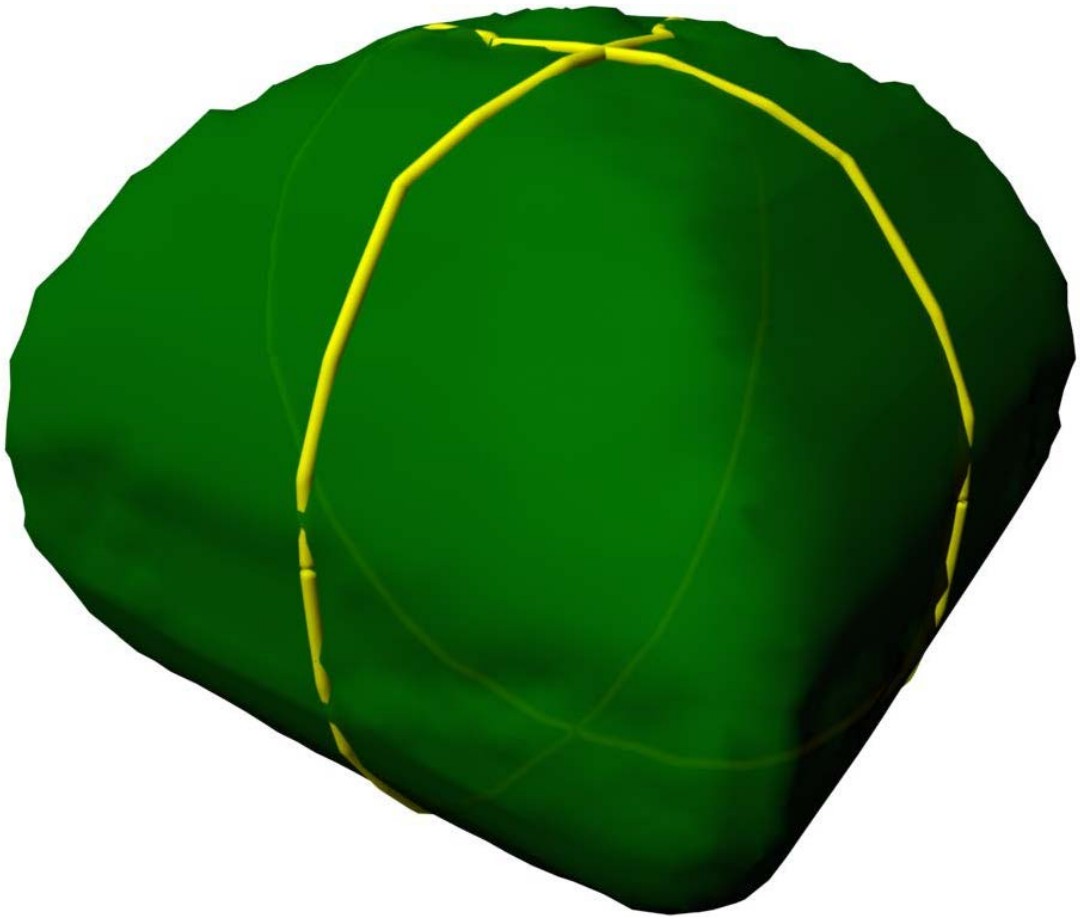


Volume Reduction

- The visual hull = maximal volume
- The user meant something else…



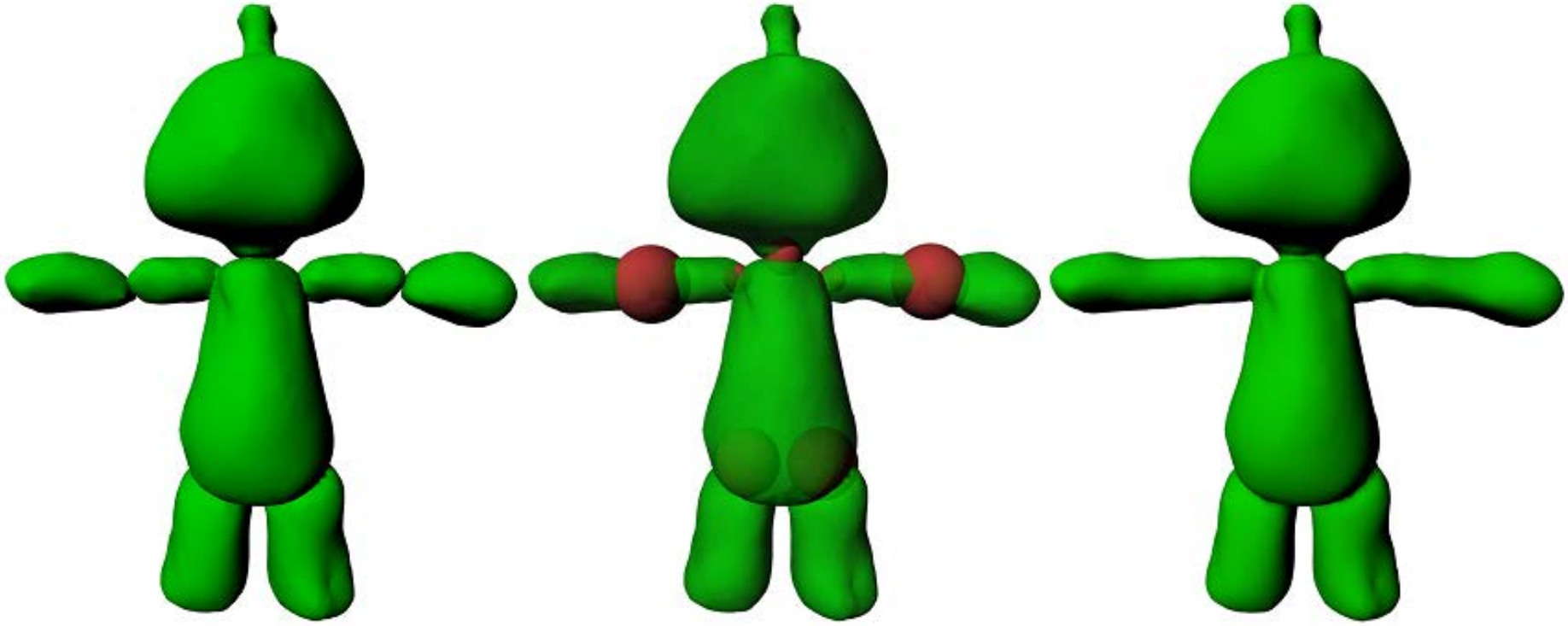
- Find rim paths (dynamic programming)
  - **Silhouette cost**
  - **Proximity cost**
  - **Geodesic cost**
  - **Barycenter cost**
  - **Normal cost**



- Bi-Laplacian equation
  - Anchors: rim points

Parts Consolidation

- Place a sphere at each joint
- Boolean union
- Bi-Laplacian equation
  - Variables: vertices inside spheres



Results