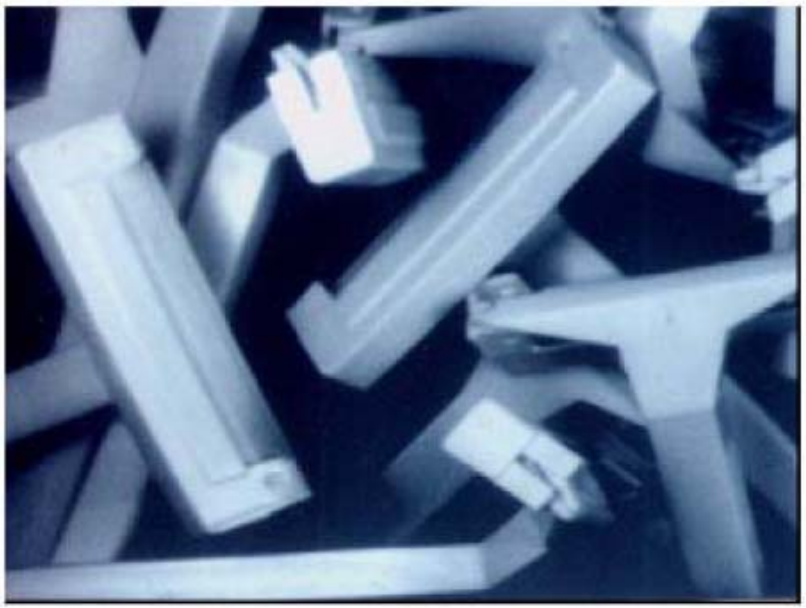
Computer Vision

Computer Graphics, CSCD18

Fall 2008

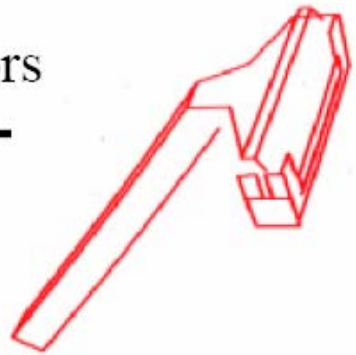
Instructor: Leonid Sigal

Object Detection



3D Model

Find the razors



Parameters: 3D position and orientation

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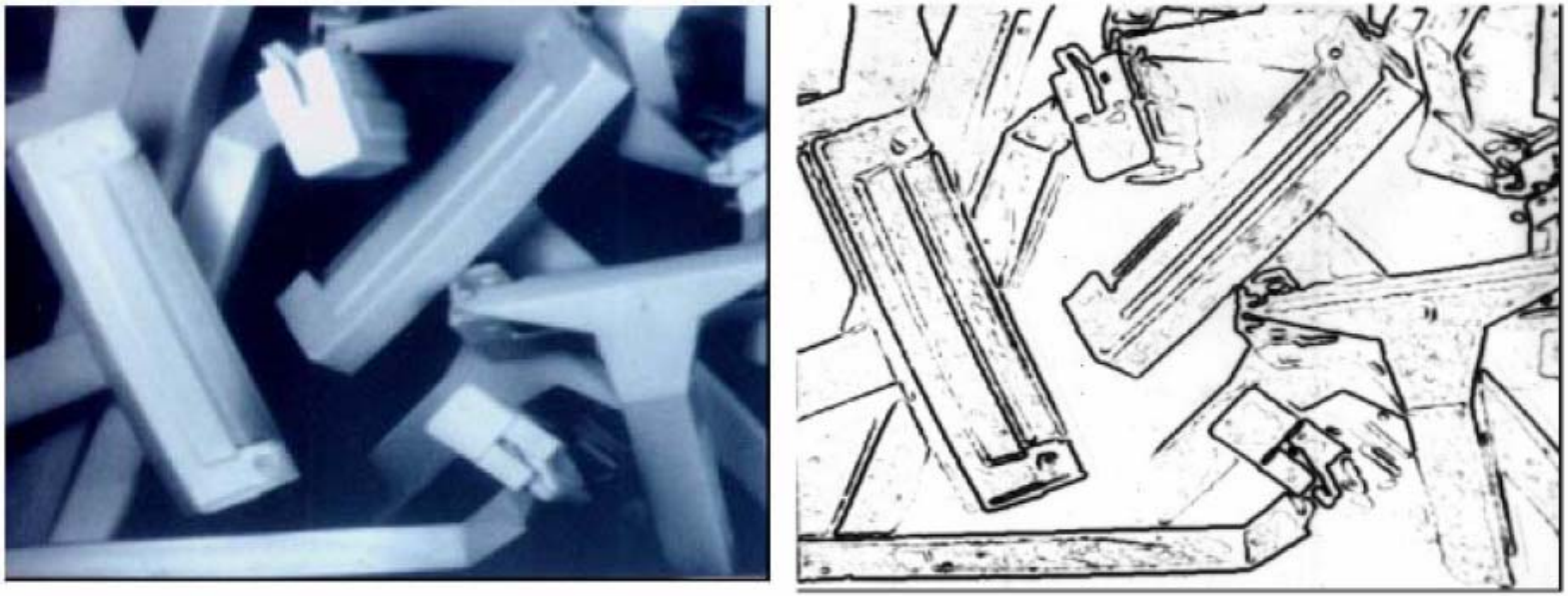
Object Detection



"Filter" image to find brightness changes.

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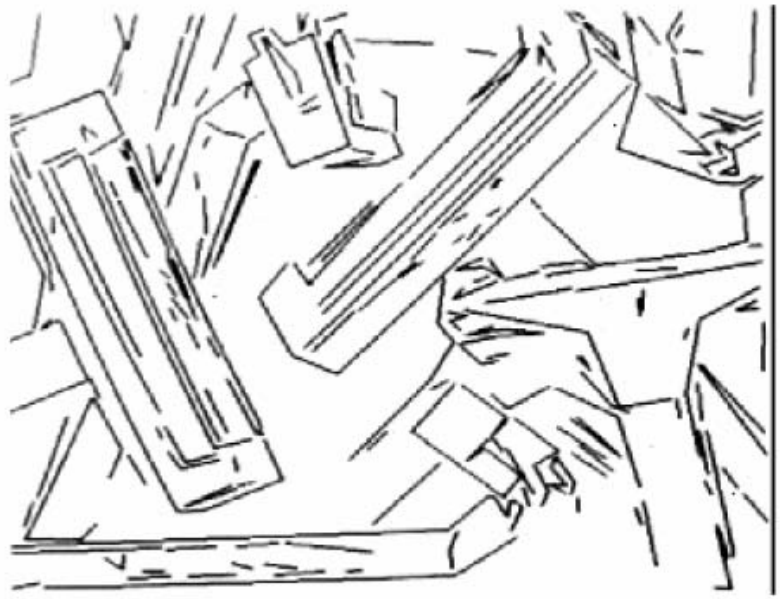

"Fit" lines to the raw measurements.

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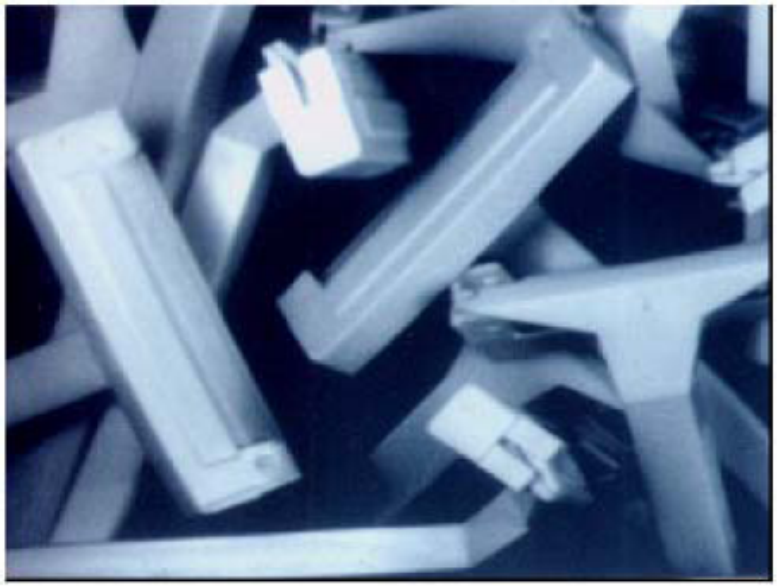
Object Detection



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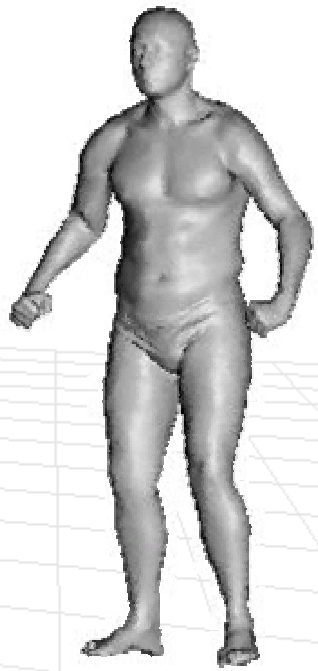
"Project" model into image and "match" to lines (solving for 3D pose).

Problem Statement

- Automatically recover articulated pose and detailed **shape** of the person from images



Why is this hard?

- Pose estimation
  - Noisy observations (e.g. clothes)
  - Occlusions (e.g. world and self-occlusions)
  - Loose of depth information in the image projection
  - High dimensionality of state space (30-40 D)

- Shape estimation
  - Noisy observations (e.g. clothes)
  - Occlusions (e.g. world and self-occlusions)
  - Loose of depth information in the image projection
  - High dimensionality (25,000 triangles)
  - Non-rigid deformations

Requirements for a body model

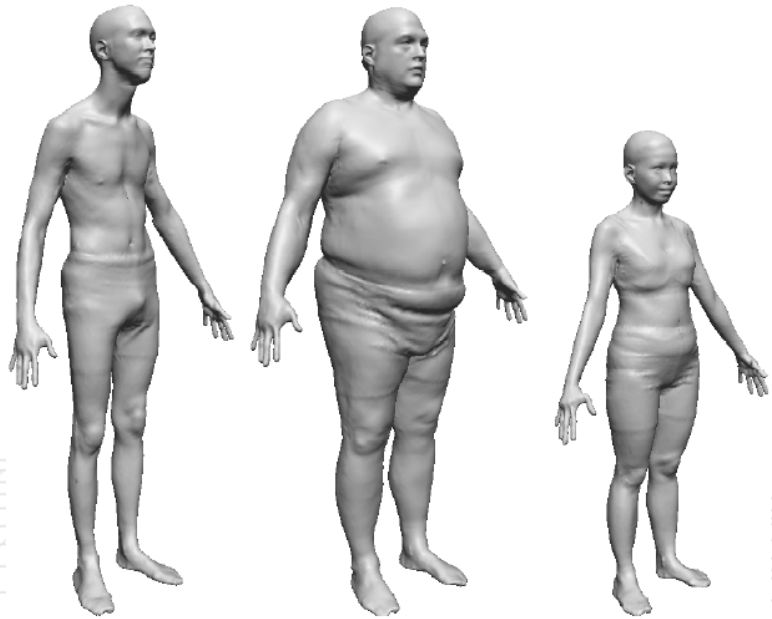
- Realistic, detailed model of the body
  - Match the shape of arbitrary previously unseen subject
  - Non-rigid (pose specific) shape variation
- Computational requirements
  - Low-dimensional parameterization

Approach: Learned body model

SCAPE: Shape Completion and Animation of PEople

[Anguelov et al. ’05]

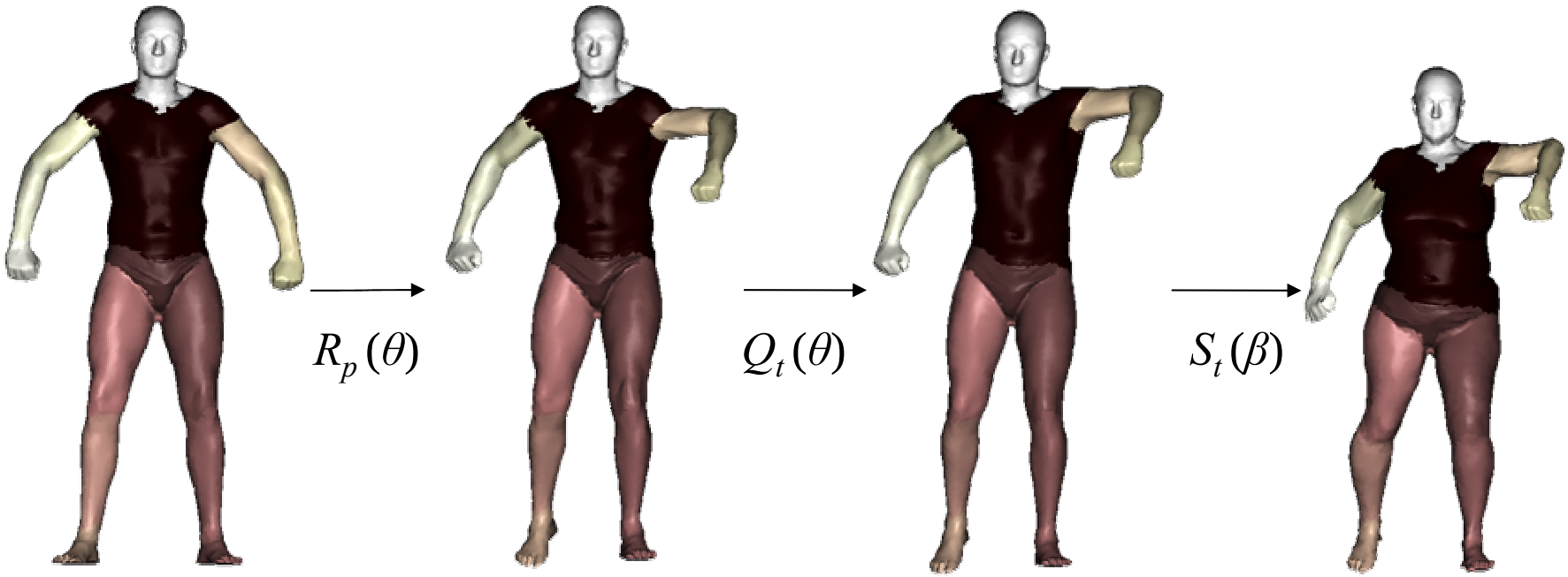
[Cyberware]



[Allen et al. ’03]

All meshes brought in full correspondence with 25,000 triangles

SCAPE deformations



θ – joint angles (37D) τ – global position (3D) β – shape parameters (9D)

Parameters (state): $\mathbf{s} = (\theta, \tau, \beta)$

[Anguelov et al. '05]

SCAPE deformations

Highly flexible, realistic, body model.

Generalizes to new people and poses.

Problem: how can we estimate this from images?

[Anguelov et al. ’05]

Proof of Concept

- Can we estimate weight loss discriminatively from monocular images?

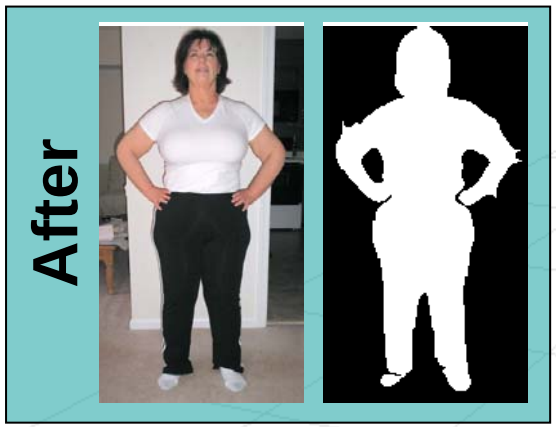
Assume density of water

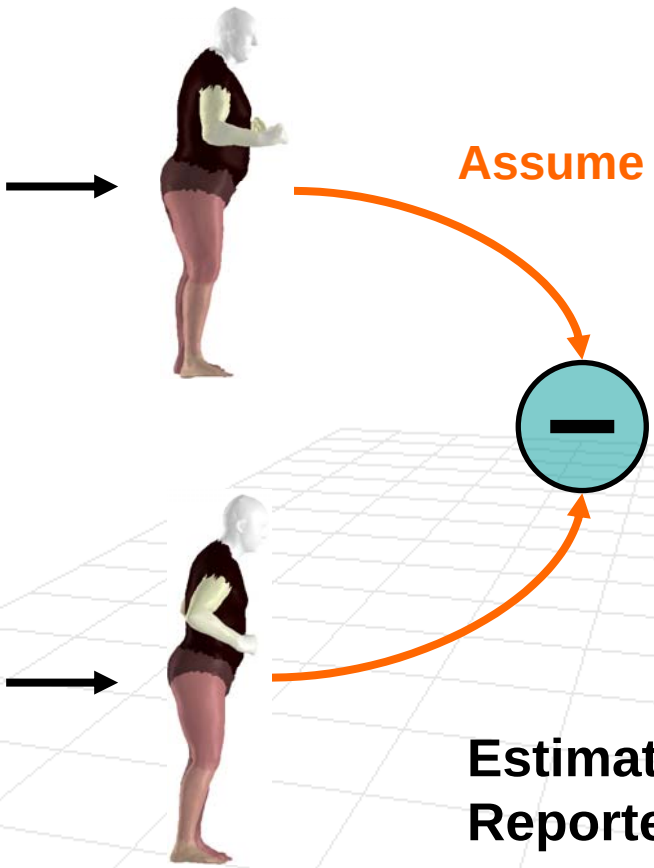
Estimated Weight Loss: 22lb

Reported Weight Loss: 24lb

Proof of Concept

- Can we estimate weight loss discriminatively from monocular images?





Estimated Weight Loss: 32lb
Reported Weight Loss: 64lb