Interpreting Line Drawings of Smooth Shapes
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**Goal:** 3D shape interpretation from line drawings of blobby, “organic” shapes

**Success if:** Output matches human shape perception (not original 3D shape)

Prior work focused on precise, “blocks world” shapes:

**Approach:** Example-based
1. Find keypoints in drawing, connect with graph
2. Select set of examples at each keypoint
3. Find most consistent global configuration
4. (Optional) Fit surface to solution

**Training Set:** Random blobby shapes

**Algorithm 1:** Label contour orientation and inflate

**PROS:** matches human perception on some shapes
**CONS:** brittle; hard to extend beyond occluding contours

1. **Keypoints are line pixels**
   - Keypoints
   - Graph: segmented curves

2. **Look up candidates from training data**
   - Orientation guesses

3. **Average guesses over graph**
   - Consistent contour orientation

4. **Inflate surface and compare with human perception**

**Algorithm 2:** Reconstruct surface normals from patches

**PROS:** flexible; generalizes to any kind of line
**CONS:** ??? (too early to say)

1a. **Place keypoints at image corners at varying scales**
   - Corner strength as defined by [Harris and Stephens 1988]
   - Add extra points to cover all line pixels

1b. **Connect keypoints based on image proximity**
   - All keypoints
   - Graph connectivity

2a. **Find patch candidates based on appearance**
   - Lines
   - Normals
   - Context

2b. **Rate compatibility of neighboring patches**
   - Patch A

3. **Find best global solution with inference on Markov Random Field from keypoint graph**

4. **Fit surface to fine-scale patches**

**Key:**
- Test image
- Original shape
- MAP solution
- MAP solution, average of all patches
- MAP solution, fine-scale only

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[Malik 1987] [Ulupinar and Nevatia 1993] [Wang et al. 2009]
(a) (b) (c) (d)

100 blobs x 20 views per blob = 2000 training pairs drawn with occluding and suggestive contours [DeCarlo et al. 2003]