Elongated Structures

- Anisotropic along specific direction
  - Shape: blood vessels, skeletons, organs
  - Scanning method: electron microscopy, MRI

- We focus on structures aligned to a predefined axis

User-Assisted Segmentation

- Connect user-given end curve/region
Probabilistic Framework

- Path $W$

- Markov chain model
  - Each slice depends only on its previous slice
  
  $\ldots$
  
  - Initialize

Transition Probability $P(w_i, w_{i+1})$

- Bilateral fall-off function
  - $d$: distance measure, $\sigma$: quality measure
  
  $\ldots$
Slice-to-Slice Correspondence

- 2D vector field $\nu$ for two consecutive slices
  - Deformable image registration
  - Regularized intensity difference energy

Minimum Cost Path

- Dijkstra-type shortest path algorithm
  - Path cost: $-\log P$
  - Minimum cost path with end constraint $w_n$
System Overview

- Start curve selection
- Probability computation
- End curve selection
- Find minimum cost paths
- Smooth surface generation

Demo
Synthetic Image

- Texture segmentation

Seismic Image

- Channel tracking
MRI Image

- Left atrium (heart) segmentation

Serial Section Transmission EM

- Axon tracking