Image and Geometry Processing

Highlights of ongoing work

• Geometry processing
• Shape analysis
• Visualization/segmentation
Geometry Processing/Modeling

- Segmentation Tools
- Volumes
- Label Maps
- Correct Topology
- Surface Meshes
- Body-Fitted Meshes
- Volumetric Topology Filtering Antialiasing
- Meshing: Adaptive, Geometrically Regular
- Integrate 3rd Party Packages (Tets)
Shape Analysis

Correspondences

Geodesics on Solid Shapes
Shape Correspondence Problem

Shape metrics that rely on correspondence

Correspondence depends on context of ensemble
Particle Systems for Adaptive Surface Sampling

Meyer et al., Under review, IEEE Vis 2006
A Particle-Based Approach

Minimize shape and ensemble entropy

Cates et al., To appear MICCAI 2006 Workshop on Foundations of Computational Anatomy
Statistical Shape Analysis
Geodesics of Solid Shapes

Fletcher and Whitaker, To appear
MICCAI 2006 Workshop on
Foundations of Computational Anatomy
Segmentation Research

Neighborhood statistics

- Manifolds in high-dimensional spaces
- Filtering, compression, segmentation, visualization

Strategy

- Nonparametric density estimation
- Engineering issues
MRI Head Segmentation

MICCAI 2005, MedIA to appear

MRI Input
GM, WM, CSF Seg.

Comparison: SOTA–EM w/MRFs & Atlas (Leemput et al.)

Collab: Makeig-Worrell, Wolters, Warfield, McIntyre
Cell/Texture Segmentation

Nonparametric density estimation – image neighborhoods
  • Texture
Partition image to reduce in-class entropy
Random initialization
Fast (nonlocal) level-set method

Collab: NCMIR, Marc
IGP Research Plans

Continued development of meshing capabilities

Shape analysis development and application

Applications of neighborhood statistics to visualization of complex data