

EE4702 Course Projects

The Course Project

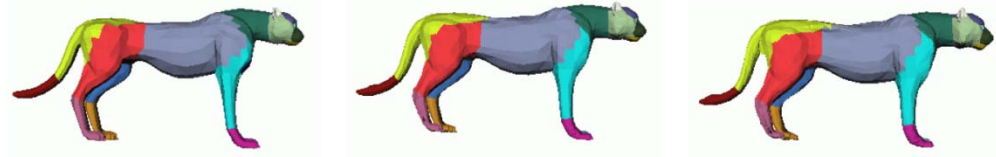
- Project Presentations
 - Time: Oct. 15th, 18th, 20th
 - Prepare: (1) presentation slides and (2) a one-page timeline
 - Describe: (1) the problem/motivation + algorithm, and (2) your plan
- What you need to do this week:
 - Pick a topic/paper from the list (see the following pages)
 - Team up if you need to (good to have 2-3 people per project)
 - Discuss with me to fix the project
 - Email me and/or come to my office
 - Start to read the paper and prepare your slides
- What you need to do on mid term presentations:
 - 1 presentation per project: 20 mins presentation + 5 mins questions
 - Send me your report: 1 page, project summary + schedule plan (due 11:59pm Oct. 12th)

Course Project Topics

- Segmentation

- 1) K-Mean

- [S. Shlafman, A. Tal and S. Katz, "Metamorphosis of Polyhedral Surfaces using Decomposition"]



- 2) Core Extraction

- [S. Katz, G. Leifman, A. Tal, "Mesh segmentation using feature point and core extraction"]



- 3) Shape Diameter Function

- [L. Shapira, A. Shamir, D. Cohen-Or, "Consistent mesh partitioning and skeletonisation using the shape diameter function"]

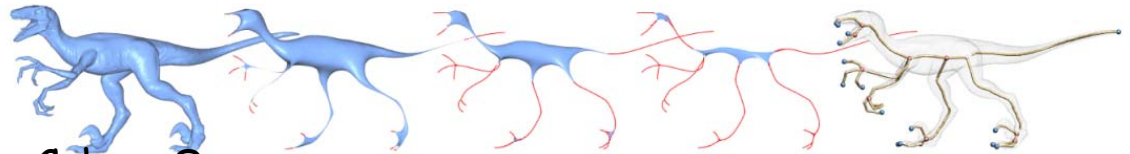


Course Project Topics

- Skeletonization

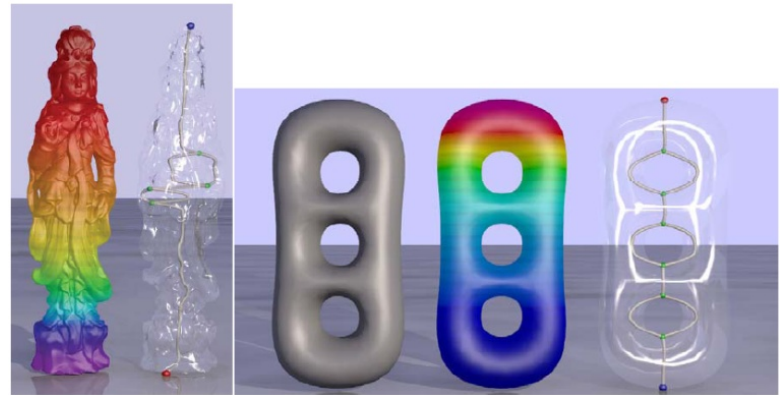
- 1) Mesh Contraction

- [O. Au, C-L Tai, H-K Chu, D. Cohen-Or, T-Y Lee, "Skeleton Extraction by Mesh Contraction", Siggraph 2008]



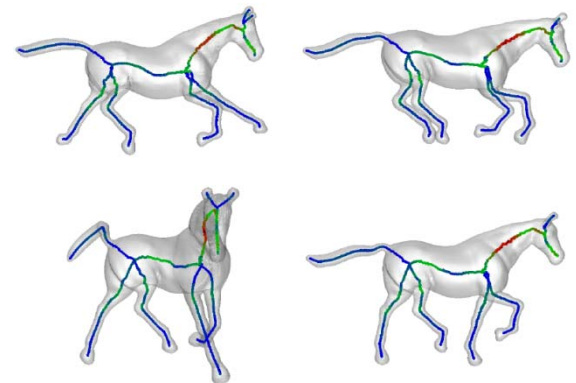
- 2) Morse Skeleton

- [V. Pascucci, G. Scorzelli, P.T. Bremer, and A. Mascarenhas, "Robust On-line Computation of Reeb Graphs: Simplicity and Speed", Siggraph 2007]



- 3) Medial Axis Function

- [Tamal K. Dey and Jian Sun, "Defining and Computing Curve-skeletons with Medial Geodesic Function", SGP 2006]



Course Project Topics

- Deformation/Animation

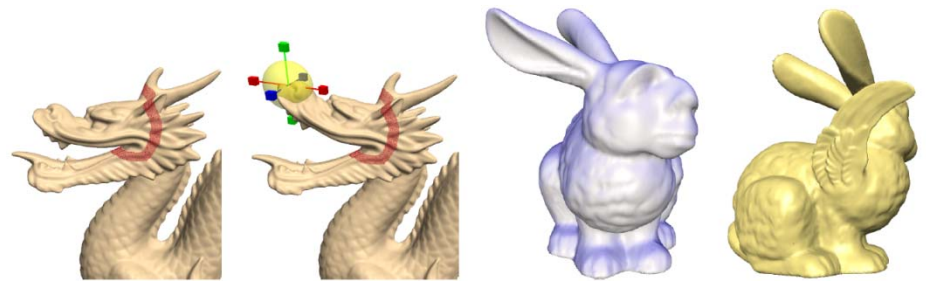
- 1) 2D Image Deformation

- [T. Igarashi, T. Moscovich, J. Hughes, "As-Rigid-As-Possible Shape Manipulation", SIGGraph05]



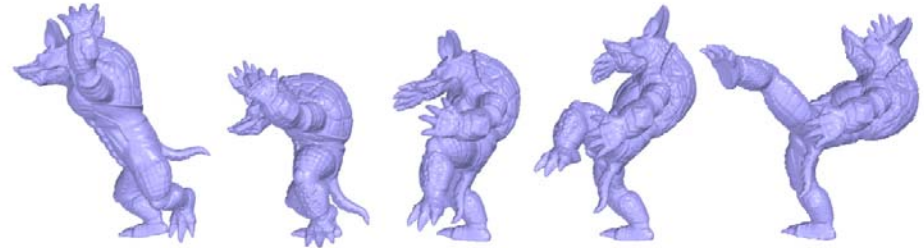
- 2) 3D Surface Deformation

- [Sorkine et. al, "Laplacian surface editing", SGP04]



- 3) Volumetric Deformation

- [K. Zhou, J. Huang, J. Snyder, X. Liu, H. Bao, B. Guo, and H.-Y. Shum, "Large Mesh Deformation using the Volumetric Graph Laplacian", Siggraph 05]



Course Project Topics

- Collision Detection

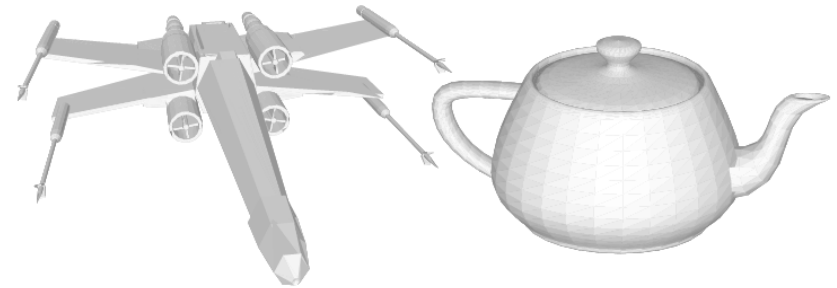
- 1) BD-Tree

- [D. James and D. Pai, "BD-Tree: Output-Sensitive Collision Detection for Reduced Deformable Models"]



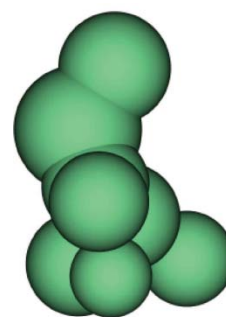
- 2) AABB Tree

- [G. VAN DEN BERGEN, "Efficient Collision Detection of Complex Deformable Models using AABB Trees"]

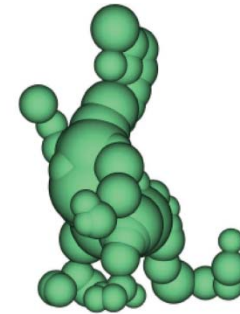


- 3) Sphere-Tree

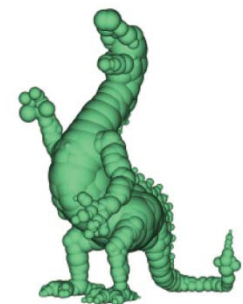
- [G. Bradshaw and C. O'Sullivan, "Adaptive Medial-Axis Approximation for Sphere-Tree Construction"]



(a) Level 1



(b) Level 2

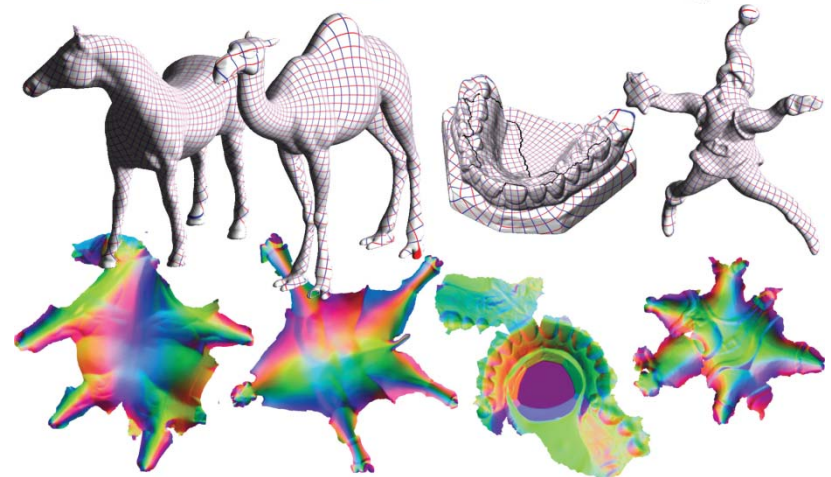
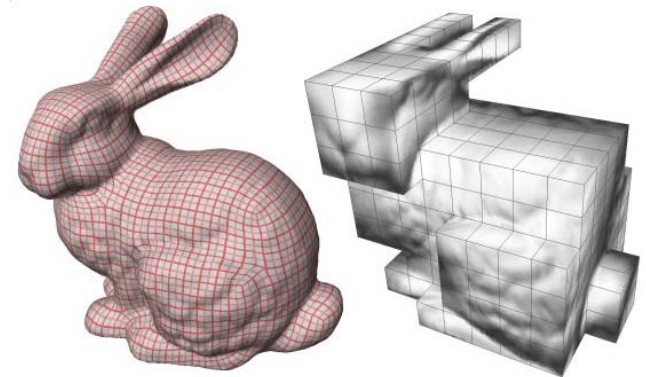
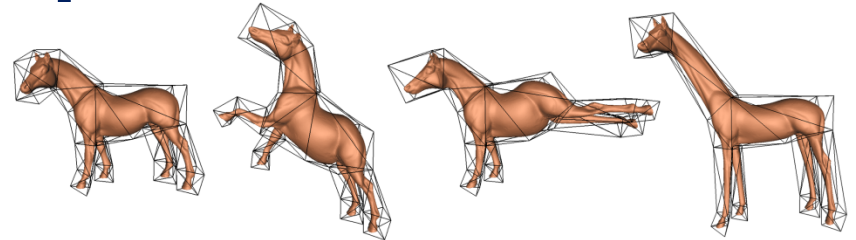


(c) Level 3

Course Project Topics

- Shape Parameterization:

- 1) [T. Ju, S. Schaefer, and J. Warren, "Mean Value Coordinates for Closed Triangular Meshes", SIG05]
- 2) [M. Tarini, K. Hormann, P. Cignoni, and C. Montani, "Polycube Map", SIG04]
- 3) [A. Sheffer, B. Levy, M. MOGILNITSKY and A. BOGOMYAKOV, "ABF++: Fast and Robust Angle Based Flattening", TOG05]



Course Project Topics

- Meshing:

→ Generating high quality discretization

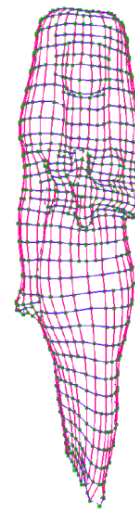
1) Isotropic triangular meshing

- [P. Alliez, E. Verdiere, O. Devillers, and M. Isenberg, "Isotropic Surface Remeshing", SMI03]



2) Anisotropic **quad**-meshing

- [S. Dong, S. Kircher, M. Garland, "Harmonic Functions for Quadrilateral Remeshing of Arbitrary Manifolds", CAGD05]



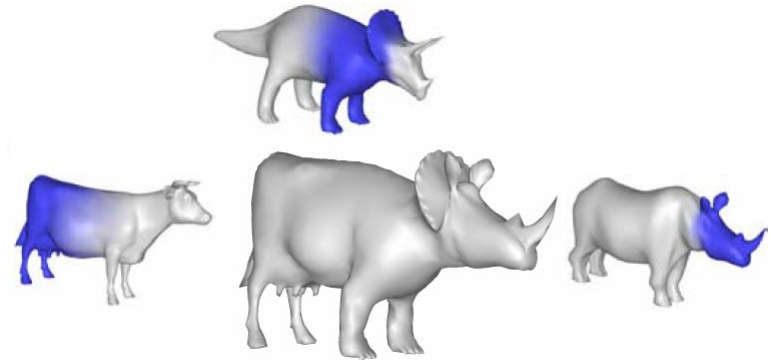
Course Project Topics

- Surface Mapping/Morphing:

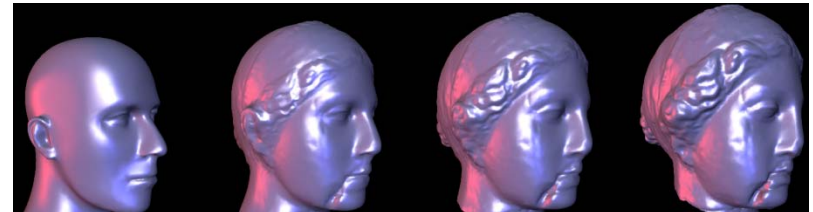
1) [J. Schreiner, A. Asirvatham, E. Praun, H. Hoppe, "Inter-Surface Mapping", SIG04]



2) [V. Kraevoy and A. Sheffer, "Cross-Parameterization and Compatible Remeshing of 3D Models", SIG04]



3) [A. Lee, D. Dobkin, W. Sweldens, P. Schroder, "Multiresolution Mesh Morphing", SIG99]

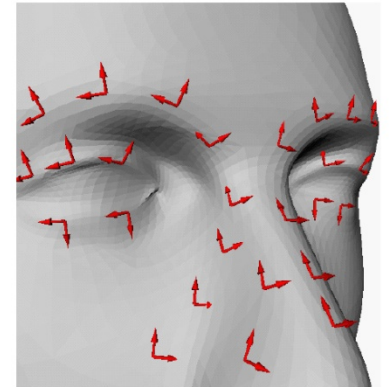
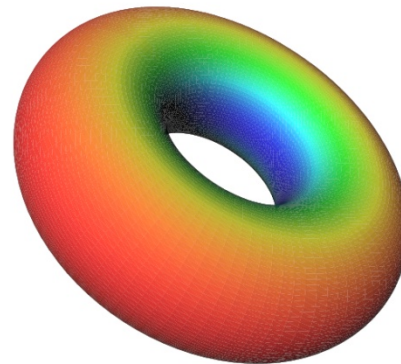


Course Project Topics

- Curvature/Feature Detection:

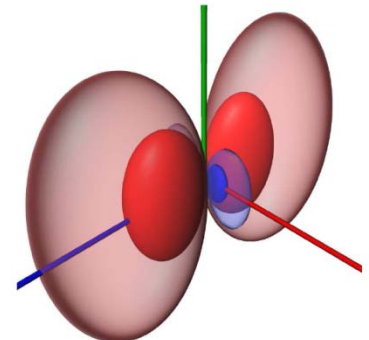
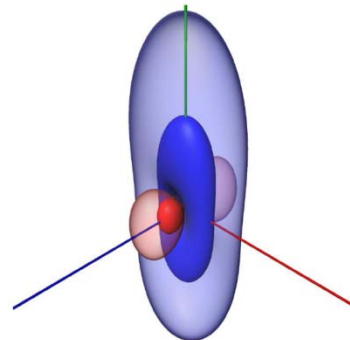
- 1) Geometric Surface Curvature Evaluation

[M. Meyer, M. Desbrun, P. Schroder, and A. Barr, "Discrete Differential-Geometry Operators for Triangulated 2-Manifolds"]



- 2) Curvature Measures of 3D Vector Fields

- [T. Weinkauff and H. Theisel, Curvature Measures of 3D Vector Fields and their Applications]



And other topics...

- Progressive tetrahedral mesh
- Scanned data reconstruction
- Shape comparison/retrieval
- ...

- Your own project or interest related to computer graphics and geometric processing:
 - come and discuss with me directly as early as possible