

Course Syllabus

September 6, 2001

September

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| Thu | 6 | L1: Introduction
<i>Reading:</i> Chapter 1. |
| Tue | 11 | L2: Segment Intersection
<i>Reading:</i> Chapter 2. |
| Thu | 13 | L3: Low-Dimensional Linear Programming
<i>Reading:</i> Sections 4.1 – 4.5, 4.7 – 4.8.
Assignment 1 out; covers L1 – L4. |
| Tue | 18 | L4: Polygon Triangulation
<i>Reading:</i> Chapter 3. |
| Thu | 20 | L5: Orthogonal Range Searching
<i>Reading:</i> Chapter 5. |
| Tue | 25 | L6: Point Location / Spatial Indexing
<i>Reading:</i> Chapter 6. |
| Thu | 27 | L7: Voronoi Diagrams
<i>Reading:</i> Chapter 7.
Assignment 1 due. |

October

- Tue 2 **L8:** Robustness and Perturbation Schemes
Reading:
Yap, Robust Geometric Computation,
CRC Handbook (1997), at
<http://cs.nyu.edu/exact/doc/handbook.ps.gz>;
Edelsbrunner and Mucke, Simulation of Simplicity:
A technique to cope with degenerate cases in geometric algorithms,
ACM Transactions on Graphics, 9:66–104, 1990;
Emiris, Canny, and Seidel,
Efficient Perturbations for Handling Geometric Degeneracies,
Algorithmica 19(1–2):219–242, September 1997.
- Thu 4 **L9:** Arrangements and Duality
Reading: Chapter 8.
Assignment 2 out; covers L5 – L10.
- Fri 5 **ADD DATE.**
- Tue 9 **Columbus Day – Vacation.**
- Thu 11 **L10:** Delaunay Triangulations, CDTs
Reading: Chapter 9.
- Tue 16 **L11:** Representing Polyhedra
Reading: TBA.
- Thu 18 **L12:** Convex Hulls
Reading: Chapter 11.
Assignment 2 due.
- Tue 23 **L13:** Representing Smooth Surfaces
Reading: TBA.
- Thu 25 **L14:** Binary Space Partitions
Reading: Chapter 12.
Assignment 3 out; covers L11 – L18.
- Tue 30 **L15:** Kinetic Algorithms
Reading:
Basch, Guibas and Hershberger,
Data Structures for Mobile Data, SODA 1997, pp. 757–756,
also J. Algorithms 31(1): 1-28 (1999).

November

- Thu 1 **L16:** Robot Motion Planning
Reading: Chapter 13.
- Tue 6 **L17:** Quadtrees and Non-Uniform Meshing
Reading: Chapter 14.
- Thu 8 **L18:** Visibility Data Structures
Reading: Chapter 15.
- Mon 12 **Veteran's Day – Vacation**
- Tue 13 **L19:** Medial Axis, Surface Reconstruction
Reading: TBA.
- Thu 15 **L20:** Higher- and High-Dimensional LP
Reading:
Gartner and Welzl,
Linear programming – randomization and abstract frameworks,
In Proc. 13th Sympos. Theoret. Aspects Comput. Sci., 1996,
volume 1046 of Lecture Notes Comput. Sci., pp. 669–687.
Assignment 3 due.
Assignment 4 out; covers L19 – L24.
- Tue 20 **L21:** Closest Pair
Reading: M. Smid, Closest-Point Problems in Computational Geometry,
at <http://citeseer.nj.nec.com/167339.html>,
paper Section 2.4 and references.
- Wed 21 **DROP DATE.**
- Thu 22 **Thanksgiving – Vacation**
- Tue 27 **L22:** Approximate Nearest Neighbor
Reading: M. Smid, Closest-Point Problems in Computational Geometry,
at <http://citeseer.nj.nec.com/167339.html>,
paper Section 5.2.4 and references.
- Thu 29 **L23:** Iterative Algorithms
Reading: TBA.

December

- Tue 4 **L24:** Approximate Nearest Neighbor (Hamming)
Reading: P. Indyk, High-dimensional computational geometry, Ph.D. thesis, Section 2.2.
- Thu 6 **L25:** Low-Distortion Embeddings
Reading: P. Indyk, Algorithmic applications of low-distortion geometric embeddings, FOCS 2001 tutorial, at theory.lcs.mit.edu/indyk/tut.ps (mainly the dimensionality reduction section).
- Tue 11 **L26:** Reductions to Approximate Nearest Neighbor
Reading: D. Eppstein, Dynamic Euclidean minimum spanning trees and extrema of binary functions, Discrete and Computational Geometry 13 (1995), pp. 111–122.
Assignment 4 due.
- Wed 12 **Last day of classes.**