

CMPS 3130/6130 Introduction to Computational Geometry

Spring 17

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Course Description:

This course will survey a list of geometric algorithms and geometric data structures. Computational Geometry is a young discipline which enjoys close relations with algorithms and data structures, discrete geometry, topology, graph theory and combinatorics. Techniques from Computational Geometry are applied in areas such as databases, sensor networks, visualization, geographic information systems (GIS), VLSI, robotics, computer graphics, and computer vision. Many geometric algorithms are elegant and clever, and have esthetical value on their own. The material of the course will be tailored to the interests of the participants. Some of the question that will be addressed are:

- How to efficiently [compute the shortest path of a robot in a room full of obstacles](#).
- How to place security guards (or cameras) in an art gallery.
- How to compute the [convex hull](#), the [Voronoi diagram and the Delaunay triangulation](#) of a point set.
- Given a map of rivers and a map of roads, [find all the points where a road crosses a river](#).
- How to [simplify a map, or a curve of a function](#), without losing too much of the information.
- Efficient ways to [compare shapes](#), for pattern recognition purposes.
- Robustness issues - how to avoid numerical errors that mislead the algorithm.

There will be regular homework assignments. Homeworks will mostly consist of written problems but may also contain some programming projects. Graduate students will receive a different set of more advanced homework problems and they will be required to read and present a recent research paper on Computational Geometry.

Please visit the [resources page](#) for links to demos and other relevant resources. A good introduction to some computational geometry problems can be found [here](#).

Prerequisites:

CMPS 2200, or consent of the instructor. Familiarity with linear algebra preferred. Please feel free to contact the instructor at `cwenk -at- tulane -dot- edu` if you have questions.

Class Webpage:

<http://www.cs.tulane.edu/~carola/teaching/cmcs3130-6130/spring17/>

Time & Place:

Tuesdays, Thursdays 3:30pm - 5pm, ST 302

Textbooks:

Required:

[Computational Geometry: Algorithms and Applications](#), (3rd Edition), M. deBerg, M. vanKreveld, M. Overmars, O. Schwarzkopf, Springer-Verlag, 2008, IABN 9783540779735

Optional:

- Computational Geometry in C (2nd edition), J. O'Rourke, Cambridge University Press, 2001, ISBN 0521649765
- Lecture notes by David Mount, available [here](#)

Instructor:[Carola Wenk](#)

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Office hours: M 2pm-3pm, W 3pm-4pm, R 12:30-1:30, and by appointment

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