Computational Geometry (COMP 5008)

Fall 2017

Instructor: Michiel Smid
Office: Herzberg Building 5125C
Email: michiel@scs.carleton.ca
Course webpage: http://cg.scs.carleton.ca/~michiel/5008.html

Course objectives: Computational Geometry is concerned with the design of efficient techniques for the computer-based representation and manipulation of geometric objects. The field has been in existence for about forty years and has blossomed into a mature body of efficient algorithmic techniques. This has not only led to a solid theoretical understanding of the complexity of geometric problems, but also to the development of several efficient and widely-used software libraries for a wide variety of basic geometric problems. These techniques have the potential to bring about significant design and performance improvements in applied fields such as Computer-Aided Design and Manufacturing, Cartography, Geographic Information Systems, and Materials Science.

Topics covered include: Convex hull algorithms, Triangulations of point sets, Euler’s formula for planar graphs, with applications, the k-set problem, Point location in planar subdivisions, Multi-level data structures (range trees, segment trees, interval trees, priority search trees), Plane sweep algorithms, Voronoi diagrams and Delaunay triangulations, Lower envelopes and Davenport-Schinzel sequences, Computing the diameter of a point set, Algorithms for geometric optimization problems, Triangulations of polygons.