Computing Science Course Outlines

CMPT 406 - D100 Computational Geometry

Instructor(s): Binay Bhattacharya

Calendar Objective/Description:
Mathematical preliminaries; convex hull algorithms; intersection problems; closest-point problems and their applications.

Instructor's Objectives:
Computational Geometry (CG) involves the design and analysis of algorithms and data structures for the solutions to algorithmic problems of a computational nature. Part of the interest in CG is due to its wealth of applications, including areas as far-reaching as: medical imaging, geographic information systems (GIS), machine learning, games, robotics, computer vision, computer graphics, and computer-aided design and manufacturing (CAD/CAM). An interesting website (http://cgm.cs.mcgill.ca/(tilda)godfried/) gives a peek to the computational geometry related activities of Prof. Godfried Toussaint. (Look at the visitor index!) Computational geometry is especially well-suited for computer science education, both in the classroom curriculum and also for independent research. It is also an important topic in competitive programming contest. Some of the objectives of the course are - develop problem solving skills, design geometric algorithms (think geometrically), to be better at applications that require geometric algorithms.

Prerequisite Requirement: A course in design and analysis of algorithms

Prerequisites:
None

Topics:
- Polygon Triangulation
- Convex Hulls
- Voronoi Diagrams
- Arrangements
- Search and Intersections
- Applications : machine learning, robotics, graphics

Grading:
The course grade will be determined by performance on assignments, a small project and a final. The class participation is encouraged. Some class assignments may require some programming. The details will be further discussed in the class.

Required Books:

Reference Books:
Computational Geometry - An Introduction, F. Preparata, Michael Shamos, Springer Verlag, 1985, 9780387961316

Academic Honesty Statement:
Academic honesty plays a key role in our efforts to maintain a high standard of academic excellence and integrity. Students are advised that ALL acts of intellectual dishonesty will be handled in accordance with the SFU Academic Honesty and Student Conduct Policies (http://www.sfu.ca/policies/gazette/student.html).