Course title: Geometric Algorithms

Lecturer(s): Stojaković Z. Miloš, Mašulović M. Dragan

Status: elective

ECTS: 7

Requirements: --

Learning objectives

Introduction of advanced topics in theory of geometric algorithms, as well as their application to solving standard geometric problems

Learning outcome

Upon completion of the course, the student should master the basic concepts of storing the geometric objects using proper data structures, as well as efficient algorithms used for manipulation of geometric objects. Also, the student should be capable of modifying the existing algorithms to fit the need.

Syllabus

Data structures for storing geometric objects. Deterministic methods for manipulation of point sets, Divide-and-conquer, sweeping. Closest pair, furthest pair. Random sample methods. Sample theorem, moment theorem. Probabilistic algorithms, online algorithms, dynamic algorithms.

Convex hull, polytopes. Various incremental algorithms for finding the convex hull of a set of points. Convex hull in 2 dimensions, relation to array sorting. Convex hull of a set of balls. Smallest enclosing ball containing given points.

Triangulations in 2 dimensions, with or without restrictions. Delaunay triangulation, triangulations in 3 dimensions. Simplices and compexes. Art gallery problems.

Binary space partitions. Painter's algorithm. Quadtrees and octrees. Hyperplane arrangements, discrepancy. Zone Theorem. Line arrangements in the plane, duality, arrangements of segments in the plane.

Recommended literature

1. Mark de Berg, Marc van Kreveld, Mark Overmars, Otfried Schwarzkopf: *Computational Geometry, Theory and Applications*, 2nd edition, Springer-Verlag, 2000.

Weekly teaching load	Lectures: 2	Student research: 0

Teaching methodology

Lectures, with active participation of the students, discussion, etc. A student is supposed to write a seminar paper.

Grading method (maximal number of points 100)
Colloquia 30 points, oral exam 70 points