Computational Geometry

Prof. Dr. Georg Umlauf

Who am I?



Prof. Dr. Georg Umlauf

− Computer graphics, geometric algorithms −

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Lecture

Lecture

- Monday: 14:00 – 15:30
- Room: F 023 (HTWG)

Practical Assignments

- Monday : 15:45 – 17:15
- Room: F 033 (HTWG)
- Deadlines: Moodle

Lecture

Lecture material

- Chapter-wise online at Moodle:

https://moodle.htwg-konstanz.de/moodle/course/view.php?id=795

- Material for the practical assignments online at Moodle:

https://moodle.htwg-konstanz.de/moodle/course/view.php?id=795

Practical Assignments

Contents

- Practical programming exercises.
- Exercise sheets and deadlines at Moodle.

Procedure

- Individual solution of the programming exercises (C++, OpenGL, Qt6).
- Usually, usage of computers and software of HTWG.
- Presentation and discussion of solution with professor.
- No team-hand-in.
- No copies of existing solutions!

Examination

Un-graded certificate (Schein)

- Successful, individual solution of practical assignments.

Graded exam

- Oral exam with individual appointment within examination period in approx. February 2026.
  - Moodle-List will be posted approx. Dec/Jan.

Content lecture

§0 Introduction
§1 Motivation, basics
§2 Convex hulls in 2d
§3 Line segment intersection
§4 Range queries: kd-trees, range-trees, ball-trees
§5 Voronoi diagrams & Delaunay triangulations
§6 Point location
§7 Polygon triangulation
§8 Convex hulls in 3d
§9 Triangulation of point clouds (not yet online)

Content practical assignments

1. Convex Hull in 2d: Graham's scan and Jarvis' march
   - Deadline: 02.11.2026

2. Line intersection: iso-oriented line segment intersection
   - Deadline: 23.11.2026

3. Range search: 2d-trees
   - Deadline: 21.12.2026

4. Delaunay triangulation: randomized algorithm
   - Deadline: 18.01.2027

Literature

Textbook:

Computational Geometry.

M. de Berg, O. Schwarzkopf, M. van Kreveld und M. Overmars, Springer. 2. Auflage, 2000.

Price: ~38€







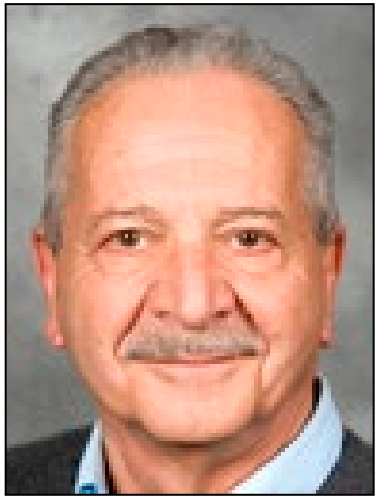


Literature

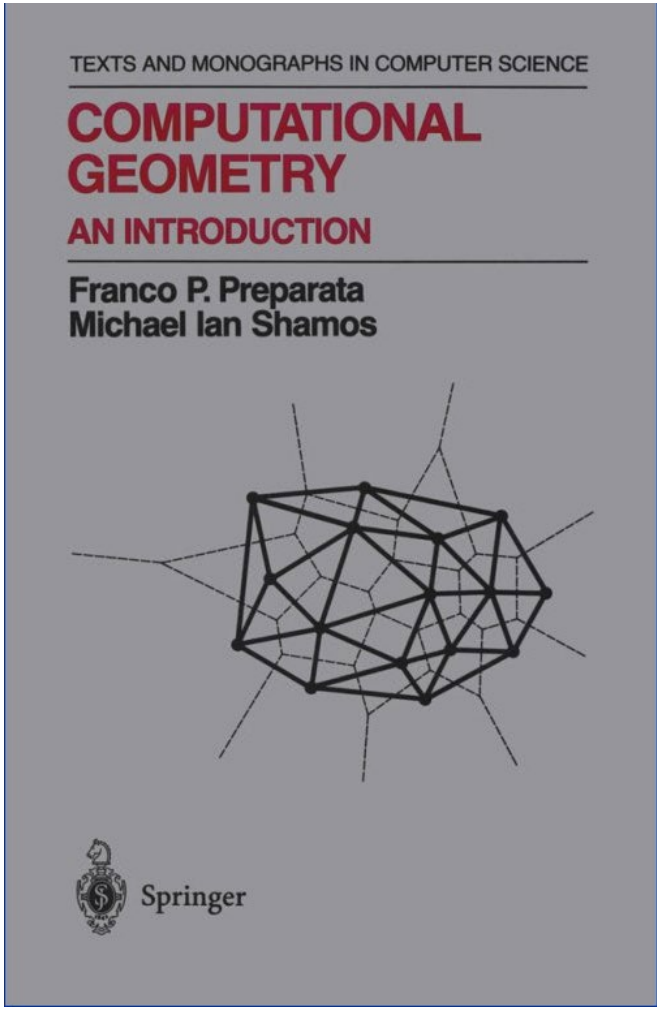
Computational Geometry – An Introduction.

F.P. Preparata und M.I. Shamos, Springer, 2. Auflage, 1988.

Price: ~100€







Literature

Algorithmische Geometrie: Grundlagen, Methoden, Anwendungen.

Rolf Klein, Springer, 2. Auflage, 2005.

Price: ~35€



