Algorithms and combinatoriccs for geometric graphs

MPRI 2-38-1

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Program

- Graphs drawn in the plane (LC): (room 1002: 15/09, 22/09, 13/10) 8h45-11h45
  - basics: combinatorial representations of planar graphs, topology, duality, Euler's formula;
  - Schnyder woods;
  - planarity testing and Tutte embedding;
  - crossing numbers of graphs;
  - efficient algorithms for planar graphs;

- Polytopes and geometric graphs (VP): (online: 29/09, 06/10, 20/10, 03/11) 9h15-10h45
  - basics: polytopes and simplicial complexes, examples and properties;
  - planar triangulations, flips, and Delaunay triangulation;
  - more combinatorial structures: permutohedra and associahedra.

- Graphs on surfaces (ECdV): (room 1002: 27/10, 10/11, 17/11), 8h45-11h45
  - warmup: some more algorithms for planar graphs;
  - classification theorem for surfaces up to homeomorphism;
  - topological algorithms for graphs on surfaces: shortest loops and systems of loops
  - Homotopy testing, and perhaps a few more things if time allows.

- Sophie Germain room 1002 on Wednesdays 15/09, 22/09, 13/10, 27/10, 10/11, 17/11 at 8:45-11:45.
- Online on Wednesdays 29/09, 06/10, 20/10, 03/11 at 9:15-10:45.

Final exam (8h45-11h45): nov 24 or dec 1st (to be decided)
Program

Course I 15/09
Intro to planar graphs

Course II 22/09
Planarity testing, graph drawing, graph algorithms

Course V 13/10
Schnyder woods and applications

Exercice sheet: on September 22nd (to be sent by October 13)