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## **CS-Colloquium**

### **The Counting of Crossing-Free Configurations in the Plane**

**Prof. Emo Welzl**  
ETH Zurich

**Wann?** 20.03. 2013, 16:00 Uhr

**Wo?** Hörsaal 3  
Währinger Straße 29  
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#### **Abstract**

Given a set  $P$  of  $n$  points in the plane, we are interested in the family of all crossing-free configurations on the given point set of a certain type. In particular, we investigate plane geometric graphs with vertex set  $P$  and edges embedded as straight line segments. Most importantly, there is the family of all triangulations of  $P$ , but we consider also crossing-free perfect matchings, spanning trees and spanning cycles (e.g. the shortest tour through  $P$  is always a crossing-free spanning cycle).

Motivated by his task of surveying, Euler was perhaps one of the first to be interested in the number of triangulations of a point set. In 1751, in a letter to Goldbach, he triggered the analysis of the situation when the points are in convex position, i.e. the vertices of a convex polygon, thus starting one thread of discovery of the Catalan numbers.

Nowadays, the restriction of "convex position" is dropped and questions of the following type are asked: What is the maximum possible number of triangulations of a set of  $n$  points? Can we efficiently enumerate (i.e. produce a list of) all triangulations of given finite point set? How can we generate a (uniformly) random triangulation of a given point set? How efficiently can we count the triangulations (i.e. determine the number of them) of a given point set? In particular the last mentioned algorithmic counting problem has experienced some recent progress due to Raimund Seidel and then Manuel Wettstein.

#### **Bio**

Emo Welzl has been Professor of Computer Science at the Institute for Theoretical Computer Science of ETH Zurich since April 1996. His research interests are in the foundations of computer science, mainly algorithms and data structures, in particular computational geometry and applications, combinatorial models for



optimization, analysis of geometric structures, randomized methods, and discrete geometry; recently also satisfiability.

1977-1981 Diplom in Applied Mathematics at the Graz University of Technology, Austria. 1983 Ph.D. (supervisor Hermann Maurer) with a topic in formal languages, 1988 Habilitation in Foundations of Computer Science, also in Graz. 1984 post-doc at Rijks University Leiden, Netherlands, 1985 visiting professor at the University of Denver, Colorado, USA, for one semester. 1987-1996 Professor of Mathematics (theory of computation) at Berlin Free University. 1994 four-month research stay at the International Computer Science Institute, Berkeley, California, USA. 1991-1996 chair of the graduate program "Algorithmic Discrete Mathematics" at Free University, Humboldt University, University of Technology, and the Konrad Zuse Center in Berlin. 2000-2005 chair (at site Zurich) of the Berlin-Zurich Graduate Program in "Combinatorics, Geometry, and Computation".

### **Contact**

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