RYERSON UNIVERSITY
DEPARTMENT OF MATHEMATICS

GRAPHS AT RYERSON (G@R) SEMINAR

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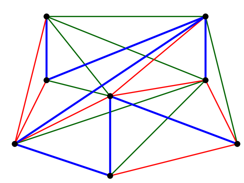
Date:	Thursday, October 4, 2018
Time:	10am
Location:	ENG 210

Packing Plane Spanning Trees into a Point Set

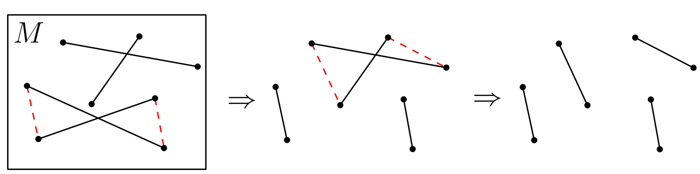
Abstract:

First Topic: Packing Plane Spanning Trees into a Point Set

Let P be a set of n points in the plane in general position. We show that at least $n/3$ non-self-crossing spanning trees can be packed into the complete geometric graph on P. This improves the previous best known lower bound $\Omega(\sqrt{n})$. Towards our proof of this lower bound we show that the center of a set of points, in the d-dimensional space in general position, is of dimension either 0 or d.



Second Topic: Flip Distance to some Plane Configurations



We study an old geometric optimization problem in the plane. Given a perfect matching M on a set of n points in the plane, we can transform it to a non-crossing perfect matching by a finite sequence of flip operations. The flip operation removes two crossing edges from M and adds two non-crossing edges. Let $f(M)$ and $F(M)$ denote the minimum and maximum lengths of a flip sequence on M, respectively. It has been proved by Bonnet and Miltzow (2016) that $f(M) = O(n^2)$ and by van Leeuwen and Schoone (1980) that $F(M) = O(n^3)$. We prove that $f(M) = O(n\Delta)$ where Δ is the spread of the point set, which is defined as the ratio between the longest and the shortest pairwise distances. This improves the previous bound if the point set has sublinear spread. For a matching M on n points in convex position we prove that $f(M) = n/2 - 1$ and $F(M) = \binom{n/2}{2}$; these bounds are tight.

Any bound on $F(\cdot)$ carries over to the bichromatic setting, while this is not necessarily true for $f(\cdot)$. Let M' be a bichromatic matching. The best known upper bound for $f(M')$ is the same as for $F(M')$, which is essentially $O(n^3)$. We prove that $f(M') \leqslant n - 2$ for points in convex position, and $f(M') = O(n^2)$ for semi-collinear points.

The flip operation can also be defined on spanning trees. For a spanning tree T on a convex point set we show that $f(T) = O(n \log n)$.

All Faculty, staff, students and guests are welcome to attend