Seminar on Combinatorial Computing
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Room 6417, Graduate Center
365 Fifth Avenue, New York

The number of directions determined by n points in space

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Abstract

Erdos pointed out the following immediate consequence of the celebrated Gallai-Sylvester theorem on ordinary lines: n non-collinear points in the plane determine at least n different connecting lines. Equality is attained if and only if all but one of the points are collinear.

In the same spirit, Scott posed two similar questions in 1970: (1) Is it true that the number of different directions assumed by the connecting lines of $n > 3$ non-collinear points in the plane is at least $n-1$? (2) Is it true that the number of different directions assumed by the connecting lines of $n > 5$ non-coplanar points in 3-space is at least $2n-3$?

The first question was answered in the affirmative by Ungar in 1982, using allowable sequences. We solve the second problem of Scott.

Joint work with Janos Pach and Micha Sharir.

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or visit our website: http://math.gc.cuny.edu/Seminars/Combinatorics.html