Graz University of Technology

Institut für Diskrete Mathematik

**Combinatorics Seminar**

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AE06, Steyrergasse 30

# Dispersion on the complete graph

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We consider a synchronous process of particles moving on the vertices of a graph $G$. Initially, $M$ particles are placed on a vertex of $G$. In subsequent time steps, all particles that are located on a vertex inhabited by at least two particles jump independently to a neighbour chosen uniformly at random. The process ends at the first step when no vertex is inhabited by more than one particle; we call this (random) time step the dispersion time.

In this talk we consider the case where $G$ is a complete graph on $n$ vertices and $M = cn$. In that case, the dispersion time undergoes a phase transition from logarithmic to exponential time when $c$ crosses the value $1/2$. We will investigate the fine details of this transition, and we will establish that there is a critical window of order $n^{1/2}$, where the dispersion time is also of that order. Moreover, we will derive very explicit descriptions of the distributions of various quantities, like the dispersion time and the total number of jumps. Within the proof we develop an explicit strategy that is based on *diffusion approximation*, a powerful tool from stochastic analysis, that allows us to describe the behavior of processes that do not concentrate around a deterministic trajectory.

This is joint work with U. De Ambroggio, T. Makai and A. Steibel.

Mihyun Kang, Ronen Wdowinski