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Zombies on the Grid

In Zombies and Survivors, a set of zombies attempts to capture a lone survivor, Mindy, on a given connected graph. The game starts with zombies randomly choosing their initial locations. Then Mindy chooses her starting vertex, provided the game is played on a finite graph; for infinite grid $\mathbb{Z}^2$, we assume that Mindy starts at the origin. At each round, each zombie independently moves to a neighbouring vertex that minimizes the distance to Mindy; if there is more than one such vertex, one is chosen uniformly at random. (Multiple zombies may occupy one vertex.) Then Mindy moves to a neighbouring vertex or stays on her current vertex. The zombies win if eventually one of them eats Mindy by landing on her vertex (or if Mindy moves to an occupied vertex); otherwise, Mindy wins.

The zombie number $z(G)$ of a finite graph G is the minimum number of zombies needed to play such that the probability that they win, against Mindy's best strategy, is at least 1/2. For infinite grid $\mathbb{Z}^2$, we are interested in estimating the expected number of rounds Mindy can survive before she gets eaten.

In this talk, I present a few results for the game played on toroidal grids $T_n = C_n \Box C_n$. I will also give bounds on the expected survival time for Mindy on the infinite grid $\mathbb{Z}^2$ with a Poisson process of zombies with density λ.

Joint work with Omer Angel and Peter Winkler.