Maker-Breaker Games on Random Geometric Graphs

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In a Maker-Breaker game on a graph G, Breaker and Maker alternately claim edges of G. Maker wins if, after all edges have been claimed, the graph induced by his edges has some desired property. We consider three Maker-Breaker games on the Random Geometric Graph $G(n, r_n)$. In this random graph model, n points are chosen uniformly at random in the unit square; two points x, y are adjacent when their distance $d(x, y) \leq r_n$. The *hitting radius* for an increasing graph property $\mathcal{P}$ is $\rho_n = \inf\{r \geq 0 : G(n, r) \text{ satisfies } \mathcal{P}\}$. For each of our three games, we show that the hitting radius for $G(n, r_n)$ to be Maker-win coincides with the hitting radius for a simple, necessary condition on the minimum degree $\delta(G(n, r_n))$. In particular, Maker wins the connectivity game when $\delta(G(n, r_n)) \geq 2$; Maker wins the Hamilton cycle game when $\delta(G(n, r_n)) \geq 4$; and Maker wins the perfect matching game when $\delta(G(n, r_n)) \geq 2$ and every edge has at least 3 neighbouring vertices. This is joint work with Andrzej Dudek, Alan Frieze, Tobias Müller, and Miloš Stojaković.