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An Analogue of Chvátal's Hamiltonicity Theorem for Randomly Perturbed Graphs

We consider Hamilton cycles in randomly perturbed graphs, that is, graphs obtained as the union of a deterministic graph H and a random graph $G(n,p)$. While most research into randomly perturbed graphs assumes a minimum degree condition on H, here we consider conditions on its degree sequence. Under the assumption of a degree sequence of H which is comparable with the classical condition of Chvátal (dependent on a parameter α analogous to the minimum degree condition in typical results in the area), we prove that there exists some constant $C = C(\alpha)$ such that taking $p = C/n$ suffices to a.a.s. obtain a Hamilton cycle in $H \cup G(n,p)$. Our result is best possible both in terms of the degree sequence condition and the asymptotic value of p, and extends the known results about Hamiltonicity in randomly perturbed graphs. We also provide results about pancyclicity under the same conditions.

This is joint work with Alberto Espuny Díaz.