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An Algorithm for the Small Quasi-Kernels Conjecture

In a digraph D, a quasi-kernel is an independent set Q such that for every vertex u, there is a vertex $v \in Q$ satisfying dist$(v, u) \leq 2$. In 1974 Chvátal and Lovász showed every digraph contains a quasi-kernel. In 1976, P. L. Erdős and Székely conjectured that every sourceless digraph has a quasi-kernel of order at most $\frac{n}{2}$. Despite significant recent attention by the community the problem remains far from solved, with no bound of the form $(1-\epsilon)n$ known. We introduce a polynomial time algorithm which greedily constructs a small quasi-kernel. Using this algorithm we prove that for any sourceless digraph D with maximum out-degree 3 contains a quasi-kernel of order at most $4n/7$.