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Separations in Symmetric Graphs

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This is a joint work with M. DeVos.

We prove a rough structure theorem for small separations in symmetric graphs. Let $G = (V, E)$ be a vertex transitive graph, let A be a finite subset of V with $|A|$ at most $|V|/2$, and let k be the number of vertices in $V\ A$ adjacent to a point in A. We show that whenever the diameter of G is at least $31(k+1)2$, either $|A| < 2k^3$, or G has a (bounded) ring-like structure and A is efficiently contained in an interval. For graphs, we apply this to get a new proof of a theorem of Babai on the structure of vertex transitive graphs with no K_n minor. Improving on the original, our argument yields explicit structural bounds. This subject is also closely connected to the study of product sets and expansion in groups, and our theorem has several applications in this context as well.