

RANDOM CAYLEY GRAPHS AND ADDITIVE COMBINATORICS WITHOUT GROUPS

PHAM HUY TUẤN

Cayley graphs provide interesting bridges between graph theory, additive combinatorics and group theory. Motivated by considerations in Ramsey theory, we study random Cayley graphs, which are constructed by fixing a finite group and choosing a generating set at random. These graphs reflect interesting symmetries and properties of the group, at the cost of inducing complex dependencies. I will discuss results on clique and independence numbers of random Cayley graphs of general groups, a proof of a conjecture of Alon and Orlitsky, as well as progress towards a conjecture of Alon on existence of Ramsey Cayley graphs in arbitrary groups. These questions are naturally connected with some fundamental problems in additive combinatorics. Surprisingly, our insights suggest that in many of these problems the group structure is superfluous and can be replaced by much more general combinatorial structures. Based on joint work with David Conlon, Jacob Fox and Liana Yepremyan.