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Growth Without Groups (Growth in Nonsymmetric Graphs: Computation and Asymptotics)

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The ball growth $b(n)$ from a vertex v in a graph G counts the number of vertices that can be reached from v by paths of length n or less; the sphere growth $s(n)$ is defined similarly with paths of length exactly n . If G is the Cayley graph for a group A with finite generating set X , the asymptotic equivalence class for $b(n)$, given a somewhat unusual definition of asymptotic equivalence, is independent of the choice of generating set and is called the growth of the group A (Milnor, Bass, Gromov, et al.). The theory for growth in vertex transitive graphs parallels that for groups (Trofimov, Imrich, Seifert, et al.). This joint work with Tomo Pisanski begins a study of growth in general graphs. To provide specific computational examples, ways of combining graphs are introduced that are analogous to group constructions, such as free products. To provide a foundation for asymptotic analysis, the two natural kinds of asymptotic equivalence are compared. A mild condition is introduced that ensures asymptotic equivalence for sphere growth from different vertices. Connections to isoperimetric inequalities and transience in random walks on graphs are also discussed.

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