Mathematics > Group Theory

Injective hulls of certain discrete metric spaces and groups

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Injective metric spaces, or absolute 1-Lipschitz retracts, share a number of properties with CAT(0) spaces. In the 1960es, J. R. Isbell showed that every metric space X has an injective hull E(X). Here it is proved that if X is the vertex set of a connected locally finite graph with a uniform stability property of intervals, then E(X) is a locally finite polyhedral complex with finitely many isometry types of n-cells, isometric to polytopes in l^n_\infty, for each n. This applies to a class of finitely generated groups G, including all word hyperbolic groups and abelian groups, among others. Then G acts properly on E(G) by cellular isometries, and the first barycentric subdivision of E(G) is a model for the classifying space \underbar{E}G for proper actions. If G is hyperbolic, E(G) is finite dimensional and the action is cocompact. In particular, every hyperbolic group acts properly and cocompactly on a space of non-positive curvature in a weak (but non-coarse) sense.

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