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Using strong contraction to obtain hyperbolicity

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If a group contains a strongly contracting element, then it is acylindrically hyperbolic. Moreover, one can use the Projection Complex of Bestvina, Bromberg and Fujiwara to construct an action on a hyperbolic space where said element acts loxodromically. However, the action depends on the chosen element and other strongly contracting elements are not necessarily loxodromic. It raises the questions whether there exists a single action on a hyperbolic space where all strongly contracting elements act loxodromically. In this talk, we answer the above question positively by introducing the contraction space construction. We then show that the contraction space can be used to extend the following dichotomy known for CAT(0) groups to other groups such as injective groups. Either the group has linear divergence, in which case all asymptotic cones are cut-point free, or the group has a Morse geodesic, in which case all asymptotic cones have cut-points and the group is acylindrically hyperbolic.

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