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ACYLINDRICAL HYPERBOLICITY OF OUT(W_n)

BRENDAN BURNS HEALY

Abstract. We prove that the group of outer automorphisms of the free Coxeter group W_n is acylindrically hyperbolic in the sense of Osin. We observe that any CAT(0) space admitting a geometric action by $\mathrm{Out}(W_n)$ must contain a rank-one geodesic as an application. Our main theorem proceeds from expanding on a well-known relationship between $\mathrm{Out}(W_n)$ and the outer automorphism group of free groups.

1. Introduction

Coxeter groups, as abstractions of reflection groups, play a critical role in both classical geometry and Lie theory, and the universal example, the free Coxeter group $W_n := *_n \mathbb{Z}/2\mathbb{Z}$, has long been studied by geometric group theorists, dating back more than 20 years to [17], for its importance to Coxeter systems. The free Coxeter group contains an easy-to-see characteristic copy of F_{n-1}, which induces a close relationship between the outer automorphisms of these groups, which we detail further in section 2. The group $\mathrm{Out}(W_n)$ has been studied by, among others, Mauricio Gutierrez, Adam Piggott, and Kim Ruane in [13] and is expected to inherit many of the properties enjoyed by $\mathrm{Out}(F_{n-1})$, though with some key differences.

The notion of acylindrical hyperbolicity was introduced by Osin [18] to unify various ideas introduced previously, such as weak proper discontinuity and weakly contracting elements. In [18], a short survey is provided of known examples of groups which satisfy this property, including most

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