Brinkmann, P.

Hyperbolic automorphisms of free groups. (English) Zbl 0970.20018

Geom. Funct. Anal. 10, No. 5, 1071-1089 (2000).

If F is a finitely generated free group, then an automorphism φ of F is called hyperbolic (in the sense of Gromov) if there exist numbers $M > 0$ and $\lambda > 1$ such that

$$\lambda|g| \leq \max\{|\varphi^M(g)|, |\varphi^{-M}(g)|\}$$

for all $g \in F$, where $|g|$ denotes the length of g with respect to some fixed basis of F. An automorphism of F is called atoroidal if it has no nontrivial periodic conjugacy classes. The main result of the paper is that an atoroidal automorphism φ of a finitely generated free group is hyperbolic. This theorem was claimed before by *M. Bestvina* and *M. Feighn* [J. Differ. Geom. 35, No. 1, 85-102 (1992; Zbl 0746.57021)] and a proof was given for the special case of irreducible automorphisms by *M. Bestvina*, *M. Feighn* and *M. Handel* [Geom. Funct. Anal. 7, No. 2, 215-244 (1997; Zbl 0884.57002)]. Here a proof is given in the general case. The methods are geometric using train track techniques developed by M. Bestvina, M. Handel and M. Feighn.

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20E05 Free nonabelian groups
20F67 Hyperbolic groups and nonpositively curved groups
57M07 Topological methods in group theory

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