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ON HAUSDORFF-GROMOV CONVERGENCE
AND A THEOREM OF PAULIN

by M. R. BRIDSON¹⁾ and G. A. SWARUP

ABSTRACT. We give an elementary account of ideas related to Hausdorff-Gromov convergence and explain how, among other things, these ideas can be used to prove a theorem of F. Paulin: If a group Γ is word hyperbolic and its outer automorphism group is infinite, then Γ acts by isometries on an \mathbf{R} -tree with virtually cyclic segment stabilizers and no global fixed points.

INTRODUCTION

The purpose of this article is to give an essentially self-contained proof of the following theorem of F. Paulin. (The technical terms appearing in this theorem are explained below.)

THEOREM (Paulin). *If Γ is a word hyperbolic group and $Out(\Gamma)$ is infinite, then Γ acts by isometries on an \mathbf{R} -tree with virtually cyclic segment stabilizers and no global fixed points.*

We feel that this theorem and (more especially) the techniques involved in its proof are central to the study of word hyperbolic groups and related topics. This is illustrated, for example, by the variety of ways in which these ideas have entered the work of Rips and Sela. The techniques in question centre on Gromov's generalisation of Hausdorff convergence, as developed in Paulin's thesis and Bestvina's work on degeneration of hyperbolic structures. In light of the continuing importance of these techniques, it seemed to us desirable that an elementary and self-contained account of them should be made available.

Let us recall the definitions of the terms appearing in the statement of Paulin's theorem. Let X be a metric space. A topological arc in X is called

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