A CLASS OF GROUPS UNIVERSAL FOR FREE $\mathbb{R}$-TREE ACTIONS

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Abstract. I report on a new construction in group theory giving rise to a kind of continuous analogue of free groups. More explicitly, given any (discrete) group G, we construct a group $\mathcal{RF}(G)$ equipped with a natural (real-valued) Lyndon length function, and thus with a canonical action on an associated $\mathbb{R}$-tree $\mathbf{X}_G$, which turns out to be transitive. Analysis of these groups $\mathcal{RF}(G)$ is difficult. However, conjugacy of hyperbolic elements is understood, as are the centralizers and normalizers of hyperbolic elements; moreover, we show that $\mathcal{RF}$-groups and their associated $\mathbb{R}$-trees are *universal* (with respect to inclusion) for free $\mathbb{R}$-tree actions. Furthermore, we prove that

$$|\mathcal{RF}(G)| = |G|^{2^{\aleph_0}},$$

and that non-trivial normal subgroups of $\mathcal{RF}(G)$ contain a free subgroup of rank $|\mathcal{RF}(G)|$, as well as a number of further structural properties of $\mathcal{RF}(G)$ and its quotient by the span of the elliptic elements.