Big free groups acting on Λ-trees

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In their paper *The combinatorial structure of the Hawaiian earring group*, Cannon and Conner define big free groups for a generating set of cardinality c which are a generalization of the fundamental group of the Hawaiian earring. They define the big Cayley graph of a big free group by inserting real intervals. The big Cayley graph coincides with the set of homotopy classes of based paths in the case of the Hawaiian earring.

Fischer and Zastrow show that there is an $\mathbb{R}$-tree metric on the set of homotopy classes of paths in the case of the Hawaiian earring but under that metric the action by the fundamental group is not by isometries. Cannon and Conner suggest defining an $\mathbb{R}^c$-metric on the set. An $\mathbb{R}^c$-metric is a distance function that takes values in $\mathbb{R}^c$. Indeed the $\mathbb{R}^c$-metric does admit for an isometric action by the fundamental group. The space is not an $\mathbb{R}^c$-tree but it is 0-hyperbolic and canonically embeds in an $\mathbb{R}^c$-tree.

The definition of the $\mathbb{R}^c$-metric leads to a $\mathbb{Z}^c$-metric on big free groups. As expected the resulting space is 0-hyperbolic and thus there is a canonical $\mathbb{Z}^c$-tree on which the group acts by isometries. The tree results from inserting $\mathbb{Z}^c$-intervals instead of inserting real intervals as in the construction of the big Cayley graph. In the case of the Hawaiian earring we can give a combinatorial description of the $\mathbb{Z}^\omega$-tree and the corresponding action.