Randomly Growing Braid on Three Strands and the Manta Ray

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Abstract

Consider the braid group $B_3 = \langle a, b \mid aba = bab \rangle$ and the nearest neighbor random walk defined by a probability ν with support $\{a, a^{-1}, b, b^{-1}\}$. The rate of escape of the walk is explicitly expressed in function of the unique solution of a set of eight polynomial equations of degree three over eight indeterminates. We also explicitly describe the harmonic measure of the induced random walk on B_3 quotiented by its center. The method and results apply, mutatis mutandis, to nearest neighbor random walks on dihedral Artin groups.

Keywords: Braid group B_3, random walk, drift, harmonic measure, dihedral Artin group.

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