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Coxeter transformations: from Lie algebras to singularity theory

Coxeter transformations play an important role in the theory of Lie algebras. Namely, the Weyl group is finite (resp. affine, contains a free subgroup) if the Coxeter elements are periodic (resp. have spectral radius 1, > 1). For a hereditary algebra $A = k\Delta$ associated to a quiver Δ without oriented cycles, the Coxeter transformation is induced from the Auslander-Reiten equivalence of the derived category $D^b(modA)$ to the Grothendieck group of A. The spectral properties of this transformation are essential to understand the representation theory of A. For canonical algebras A over the complex numbers, spectral properties of the Coxeter transformations are related to the classification of Fuchsian groups and their asociated singularities.