# Classifying the Fine Structures of Involutions Acting on Root Systems

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We consider real reductive symmetric spaces produced by Lie groups with an involution and the orbits of parabolic subgroups acting on these symmetric spaces. The characterization of this group action involves the action of both the symmetric space involution $\theta$ on maximal $\mathbb{R}$-split tori and that of its opposing involution $-\theta$. We focus on the algebraic and combinatorial structures of these symmetric spaces using the action of involutions on their associated root systems. The classification of the fine structures of root systems, produced by an involution, help to better understand the action of both $\theta$ and $-\theta$. This work focuses on building results and algorithms that enable one to derive such classifications. It involves algebraic group theory, combinatorics and symbolic computation.

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