

Computational Aspects of Root Systems

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In this article, our goal is to survey some of the combinatorial problems that arise in working with the structures of root systems, their symmetries and Weyl groups. In a series of papers I found and classified all root systems satisfying a condition corresponding to the Jacobi identity for Lie algebras. Root systems do not come only in the study of Lie algebras but they occupy a central position in Lie theory, finite groups and other branches in mathematics, and are also intriguing objects of study for their own sake. I would like to discuss in detail one of these root systems, namely *Witt root systems* among which are the root systems of the Symmetric Lie algebras. We investigated these root systems by computing and classifying the root systems of 2-sections. We construct canonically a certain root system W within a root system R . Then after determining the structure of triangular root diagrams with an S_2 edge and W_2 edge, we get the decomposition $W \oplus S_n(R')$, where R' is a Witt root system of rank less than the rank of R .