de Graaf, Willem A.
Lie algebras: theory and algorithms. (English) [Zbl 1122.17300]
North-Holland Mathematical Library 56. Amsterdam: North-Holland (ISBN 0-444-50116-9/hbk). xii, 393 p. (2000).

Publisher's description: The aim of the present work is two-fold. Firstly it aims at a giving an account of many existing algorithms for calculating with finite-dimensional Lie algebras. Secondly, the book provides an introduction into the theory of finite-dimensional Lie algebras. These two subject areas are intimately related. First of all, the algorithmic perspective often invites a different approach to the theoretical material than the one taken in various other monographs. Indeed, on various occasions the knowledge of certain algorithms allows us to obtain a straightforward proof of theoretical results (we mention the proof of the Poincaré-Birkhoff-Witt theorem and the proof of Iwasawa's theorem as examples). Also proofs that contain algorithmic constructions are explicitly formulated as algorithms (an example is the isomorphism theorem for semisimple Lie algebras that constructs an isomorphism in case it exists). Secondly, the algorithms can be used to arrive at a better understanding of the theory. Performing the algorithms in concrete examples, calculating with the concepts involved, really brings the theory of life.

Chapter headings: Basic constructions. On nilpotency and solvability. Cartan subalgebras. Lie algebras with non-degenerate Killing form. The classification of the simple Lie algebras. Universal enveloping algebras. Finitely presented Lie algebras. Representations of semisimple Lie algebras. Appendix: On associative algebras.

MSC:

17-02	Research exposition (monographs, survey articles) pertaining to nonassociative rings and algebras
17-08	Computational methods for problems pertaining to nonassociative rings and algebras
17Bxx	Lie algebras and Lie superalgebras
17-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to nonassociative rings and algebras
68W30	Symbolic computation and algebraic computation

Cited in **43** Documents

Software:

GAP