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Computing Parabolically Induced Embeddings of Semisimple Complex Lie Algebras in Weyl Algebras

An arbitrary proper parabolic subalgebra $\mathfrak{p}$ of a simple complex Lie algebra $\mathfrak{g}$ induces an embedding $\mathfrak{g} \to \mathbb{W}_n$, and more generally an embedding $\mathfrak{g} \to \mathbb{W}_n \otimes \operatorname{End} V$, where $\mathbb{W}_n$ is the Weyl algebra in n variables, n is the dimension of the nilradical of $\mathfrak{p}$, and V is an arbitrary $\mathfrak{p}$-module. We give an elementary proof of this known fact, report on a computer program computing the embeddings, and tabulate exceptional Lie algebra embeddings $G_2 \to \mathbb{W}_5$, $F_4 \to \mathbb{W}_{15}$, $E_6 \to \mathbb{W}_{16}$, $E_7 \to \mathbb{W}_{27}$, $E_8 \to \mathbb{W}_{57}$ arising in this fashion.

Keywords: Generalized Verma modules, exceptional Lie algebras, realization of exceptional Lie algebra, Weyl algebra.

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