Constructive noncommutative invariant theory

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Given a finite set of simple representations of a reductive linear algebraic group over the complex field, there exists a uniform degree bound for generators of the ring of invariants on a representation all of whose simple summands belong to the given finite set. This is a consequence of Weyl's Theorem on polarization. Although the latter theorem does not seem to have an analogues for Lie nilpotent relatively free algebras (that provide otherwise a good framework for non-commutative generalizations of some basic theorems in classical commutative invariant theory), the conclusion of the first statement above holds in this context. This is a consequence of a more general result showing how the problem of finding generators of the subalgebra of invariants under the action of a group of automorphisms of a finite dimensional Lie algebra on its universal enveloping algebra can be reduced to finding homogeneous generators of the same group acting on the symmetric tensor algebra of the Lie algebra. The talk is based on joint work with Vesselin Drensky.