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02155. *Linear factors for the action of an algebraic group on a split unipotent group.*

Let k be an arbitrary field, and let G be a linear algebraic group over k . If G acts on a vector group V over k by automorphisms of algebraic groups, the action of G on V is *linear* if there is a G -equivariant isomorphism of algebraic groups $V \simeq \text{Lie}(V)$.

In some recent work, we give examples of vector groups V having non-linear action of G . On the other hand, if the G -module $\mathring{A}(V)$ of additive regular functions on V is completely reducible, we show that the action of G on V is linear.

Using this latter result, we prove that if the unipotent radical of G is defined and split over k , then any split unipotent algebraic group U over k on which G acts by group automorphisms has a filtration by G -stable closed subgroups for which each successive quotient group is a vector group on which G acts linearly.

The talk will give an overview of these results. (Received January 17, 2012)