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Slices for biparabolics of index one

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Let $\mathfrak a$ be an algebraic Lie subalgebra of a simple Lie algebra $\mathfrak g$ with index $\mathfrak a \leq \rank \mathfrak g$. Let $Y(\mathfrak a)$ denote the algebra of $\mathfrak a$ invariant polynomial functions on $\mathfrak a^*$. An algebraic slice for $\mathfrak a$ is an affine subspace $\eta+V$ with $\eta \in \mathfrak a^*$ and $V \subset \mathfrak a^*$ a subspace of dimension index $\mathfrak a$ such that restriction of function induces an isomorphism of $Y(\mathfrak a)$ onto the algebra $R[\eta+V]$ of regular functions on $\eta+V$. Slices have been obtained in a number of cases through the construction of an adapted pair (h,η) in which $h \in\mathfrak a$ is ad-semisimple, η is a regular element of $\mathfrak a^*$ which is an eigenvector for h of eigenvalue minus one and V is an h stable complement to $(\ad \mathfrak a)\eta$ in $\mathfrak a^*$. The classical case is for $\mathfrak g$ semisimple. Yet rather recently many other cases have been provided. For example if $\mathfrak g$ is of type A and $\mathfrak a$ is a "truncated biparabolic" or a centralizer. In some of these cases (particular when the biparabolic is a Borel subalgebra) it was found that η could be taken to be the restriction of a regular nilpotent element in $\mathfrak g$. Moreover this calculation suggested how to construct slices outside type A when no adapted pair exists. This article makes a first step in taking these ideas further. Specifically let $\mathfrak a$ be a truncated biparabolic of index one (and then $\mathfrak g$ is of type A). In this case it is shown that the second member of an adapted pair (h,η) for $\mathfrak a$ is the restriction of a particularly carefully chosen regular nilpotent element of $\mathfrak g$.

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