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On the Local Structure Theorem and Equivariant Geometry of Cotangent Bundles

Let G be a connected reductive group acting on an irreducible normal algebraic variety X. We give a slightly improved version of Local Structure Theorems obtained by Knop and Timashev, which describe the action of some parabolic subgroup of G on an open subset of X. We also extend various results of Vinberg and Timashev on the set of horospheres in X. We construct a family of nongeneric horospheres in X and a variety $\mathcal{H}or_X$ parameterizing this family, such that there is a rational G-equivariant symplectic covering of cotangent vector bundles $T^*_{\mathcal{H}or_X} \to T^*_X$. As an application we recover the description of the image of the moment map of T^*_X obtained by Knop. In our proofs we use only geometric methods which do not involve differential operators.

Keywords: Cotangent bundle, moment map, horosphere, Local Structure Theorem, little Weyl group.

MSC: 14L30; 53D05, 53D20