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Deformation theoretic methods in the theory of algebraic transformation spaces*

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Introduction

The main object of this paper is to prove rough principal orbit theorems for actions of algebraic groups in characteristic $p>0$. The type of theorem which is intended is one which would give sufficient conditions so that in an action of a linear algebraic group G on a non-singular variety X over an algebraically closed field K, there would be a dense open subset $U \subset X$ on which connected components of stabilizers would be conjugate.

Our method is to apply the techniques of deformation theory to algebraic actions. We begin, in sections 1–3, with what is a treatment of the deformation theory of subgroups of an algebraic group. As we are concerned with a geometric application, we have found that neither the deformation theory of smooth groups, nor the theory of formal deformations is entirely adequate. A somewhat technical analysis of the deformations of finite (non-commutative) group-schemes has proven to be necessary. In later sections this analysis is applied to the stabilizer of the identity map of a space with an aciton. The arguments are analogous to arguments which proved effective in char-

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