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Explicit liftings of conjugacy classes in finite reductive groups

Let k be a field, $\tilde{G}$ a connected reductive k-group, and Γ a finite group. Previous work with Adler defined what it means for a connected reductive k-group G to be *parascopic* for $(\tilde{G}, \Gamma)$. (Roughly, this is a generalization of the situation where Γ acts on $\tilde{G}$, and G is the connected part of the group of Γ-fixed points in $\tilde{G}$.) In this setting, there is a canonical map $\mathcal{N}^{st}$ of stable semisimple conjugacy classes from the dual $G^\wedge(k)$ to $\tilde{G}^\wedge(k)$. When k is finite, this implies a lifting from packets of representations of $G(k)$ to those of $\tilde{G}(k)$. After reviewing this theory, we describe a method for decomposing a given instance of parascopy into simple atomic components for which $\mathcal{N}^{st}$ arises from an explicit k-morphism $G^\wedge \longrightarrow \tilde{G}^\wedge$. As a consequence, our lifting of representations is seen to be compatible with Shintani lifting in some important cases. In other cases, our lifting factors through the set of representations of an intermediate group.