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Representation spaces for central extensions and almost commuting unitary matrices

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The space Hom (Γ, G) of homomorphisms from a discrete group Γ to a Lie group G is studied in algebra, topology and physics. In the case of $\Gamma = Z^n$, it is the space of ordered commuting n–tuples in G and has been analyzed using a variety of methods from algebraic topology and representation theory. We would like to consider the case where Γ is a central extension of the form $1 \to Z^r \to \Gamma \to Z^n \to 1$ and $G = U(m)$ is a unitary group. We enumerate and describe the structure of the connected components of Hom (Γ, $U(m)$) and the associated moduli spaces Rep (Γ, $U(m)$). This is joint work with Alejandro Adem.