

Bag representation for composite degrees of freedom in lattice gauge theories with fermions

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We explore new representations for lattice gauge theories with fermions, where the space time lattice is divided into dynamically fluctuating regions, inside which different types of degrees of freedom are used in the path integral. The first kind of regions is a union of so-called bags, in which the dynamics is described by the free propagation of composite degrees of freedom of the original fermions. In the second region, called complementary domain, configurations of the remaining interacting degrees of freedom are used to describe the dynamics. We show that for non-abelian gauge groups at strong coupling and for abelian gauge groups at arbitrary coupling, the contribution from each bag can be computed as a determinant when the composite degrees of freedom are fermions, or as a permanent when the composite degrees of freedom are bosons.

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