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Lattice improvement of nuclear shape calculations using unitary transformations

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We present a method to improve the lattice effective field theory description of the shape of atomic nuclei by applying unitary transformations to the Hamiltonian. The employed unitary operator is constructed as a reflection transformation from the original and the desired wave function. Similarly to a derivative expansion, it can be improved systematically so that one can tune the $\langle r^n \rangle$ expectation values order by order for the two-particle system. Moreover, the effects of the three-particle operators induced by the unitary transformation have been investigated. The method might be helpful to reduce lattice artifacts in radii and electromagnetic moments.

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