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Auxiliary Field Variational Monte Carlo method: an efficient variational method for nuclear computational theory[1] MOHAMED BOUADANI, Arizona State University — Realizing efficient and accurate calculation of hadronic properties requires a realistic wave-function which correlated basis function theory offer. In spite of the complex nuclear interaction that hinders advances in diagrammatic techniques, elaborated computational methods like Green function Monte Carlo have had important successes but are limited to small size nuclei with $A \leq 12$ and pure neutron matter with $N \leq 14$. A novel approach will be described based on auxiliary fields method to circumvent the many-body state dependence of the leading two-body operators in the Hamiltonian. This Auxiliary Fields Variational Monte Carlo, AFVMC, method has been successively implemented for the sampling of the Jastrow form wave-functions with the dominant v_6 type operators with a computational scaling as $\leq A^4$. Results show good agreement with other methods. First variational calculations for twenty neutron drop, ^{20}n, and some mid-size nuclei like Oxygen-16 will be shown. This AFVMC calculation show a reasonable possibility of a pioneered Path-Integral calculation for nuclear matter.

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