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Interlaced coarse-graining for the dynamical cluster approximation[1] URS HAEHNER, ETH Zurich, PETER STAAR, IBM Research - Zurich, MI JIANG, ETH Zurich, THOMAS MAIER, Oak Ridge National Laboratory, THOMAS SCHULTHESS, ETH Zurich — The negative sign problem remains a challenging limiting factor in quantum Monte Carlo simulations of strongly correlated fermionic many-body systems. The dynamical cluster approximation (DCA) makes this problem less severe by coarse-graining the momentum space to map the bulk lattice to a cluster embedded in a dynamical mean-field host. Here, we introduce a new form of an interlaced coarse-graining and compare it with the traditional coarse-graining. We show that it leads to more controlled results with weaker cluster shape and smoother cluster size dependence, which with increasing cluster size converge to the results obtained using the standard coarse-graining. In addition, the new coarse-graining reduces the severity of the fermionic sign problem. Therefore, it enables calculations on much larger clusters and can allow the evaluation of the exact infinite cluster size result via finite size scaling. To demonstrate this, we study the hole-doped two-dimensional Hubbard model and show that the interlaced coarse-graining in combination with the DCA$^+$ algorithm permits the determination of the superconducting T_c on cluster sizes, for which the results can be fitted with the Kosterlitz-Thouless scaling law.

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