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A Multigrid Based Eigensolver for the Hermitian Wilson Dirac Operator

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In this talk, we present a multigrid based eigensolver for computing low modes of the hermitian Wilson Dirac operator. For the non-hermitian case, multigrid methods have already replaced conventional Krylov subspace solvers in many lattice QCD computations. Since the gamma5 preserving aggregation based interpolation is valid for both, the hermitian and the non-hermitian case, inversions of very ill-conditioned shifted systems with the non-hermitian operator become feasible. This enables the use of multigrid within shift-and-invert type eigensolvers. We show numerical results from our MPI-C implementation of a Rayleigh quotient iteration with multigrid. For
state-of-the-art lattice sizes and moderate numbers of desired low
modes we achieve speed ups of an order of magnitude and more over
PARPACK.

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