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## GPU-Based Conjugate Gradient Solver for Lattice QCD with Domain-Wall Fermions

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We present a GPU-based conjugate gradient (CG) solver for lattice QCD with domain-wall fermion (DWF). It is well known that CG is the most time-consuming part in the hybrid Monte Carlo simulation of unquenched lattice QCD, which becomes even more computational demanding for lattice QCD with exact chiral symmetry. We have implemented the CG for a general 5-dimensional DWF operator on NVIDIA's CUDA architecture with mixed-precision, using the defect correction as well as the reliable updates algorithms. For NVIDIA's GTX 285, our CG solver for the optimal domain-wall fermion achieves 180 Gflops (sustained). Since the performances of the defect correction and the reliable updates depend on the source vector, which also change at different stages of the CG, we investigate a dynamically adaptive scheme which can pick the best one among these two algorithms such that the entire CG can attain the optimal performance.

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talk

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