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Towards a new lattice QCD code: performances and first applications

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We present a recently started project of a new implementation of a C++ code-base to perform lattice QCD calculations.
As a first step, we have implemented a Multi-Hit Metropolis algorithm for generating configurations in Yang-Mills theory and a third order Runge-Kutta scheme for
applying the Gradient Flow to the gauge fields.
We performed tests of the autocorrelation time of the energy density and of the topological charge to find suitable parameters for the Metropolis algorithm.
The scaling properties of the code have also been studied and results show that the strong scaling efficiency coefficient is $\eta_{\mathrm{S}} \approx 80\%$ for
an increase in processor number of 2^4.
Collectives are handled using MPI and plans of using features from the 3.0 standard are presented. The program so far has been tested on three different clusters
with up to 2^{10} cores.\\
To demonstrate the capabilities of the new code-base we performed a calculation of $\Lambda_{\overline{\mathrm{MS}}}$ for pure-gauge theory using the gradient flow to define an energy scale as $q = 1/\sqrt{8t}$ finding results, through an unbiased multi-fitting procedure, consistent with the existing literature.

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