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A Parallelized Soft for Lattice QCD Simulations

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Lattice Quantum Chromodynamics (LQCD) is the lattice discretization of QCD theory, the mathematically formulation that describes the strong interactions between elementary particles. It is based on complex numerical algorithms that comes from a similarity one by one among the path integral in statistical mechanics and the Markov chain in the Monte Carlo algorithm. Solving QCD theory with Monte Carlo simulations it has a large computational cost and often these kinds of simulations have to be done in supercomputer with high computation speed and power. In addition to the complexity of formulating the theory in lattice, the computational cost is increased by the fact that in order to be as close as possible to the continuous limit we have to do simulations in as large lattices as possible. For these purposes we bring in this paper a study that present the efficacity of FermiQCD software when it is used in parallel cores. This paper gives a very good start point for lattice QCD community that a very optimal way to win time and computational cost it is to use parallel simulations using the most appropriate software for such kind of calculations such as FermiQCD. In our paper, FermiQCD software testing was done with quenched quantum chromodynamics simulations, in SU(3) gauge calibrations. One of the main advantages of FermiQCD over other libraries is the fact that it is based on a simple object-oriented programming structure as opposed to a "procedural" design. The results shows that this software is on of the optimal parallelized soft as for now in the research field of lattice QCD community. We found out that this software has a very good scaling for number of cores up to five. The computing time of the computation decreases exponentially with the increase of the number of processors used for a node, for a fixed lattice volume. All parallel simulations are done under High Performance Computing Project for South East European countries.

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