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Progress in thimble regularization: a new algorithm, 0+1 QCD and beyond

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In the context of the chiral random matrix model we introduced a way to compute lattice quantum field theories on Lefschetz thimbles by taking into account the contributions to the functional integral which come from complete flow lines. The latter are the steepest ascent paths attached to critical points, i.e. the basic building blocks of thimbles. While the thimble regularization was successfull in solving the chiral random matrix model, the simulating algorithm we first made use of was the roughest one could devise, i.e. static, crude Monte Carlo. The static, crude Monte Carlo was also useful in solving QCD in 0+1 dimensions at finite chemical potential, whose results we will present in the talk. We have also come up with a new algorithm, which is based on a heat bath sampling of the gaussian approximation of the thimble: this defines the proposals for a Metropolis-like accept/reject step. We present this new algorithm, showing its effectiveness in the case of the chiral random matrix model and discussing applications to other theories. In particular, we are going to address the issues and the formalism for thimble regularization of Yang Mills theory in 2 dimensions with complex coupling.

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