

Quantum Monte Carlo Methods

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After a brief review of the discretized path-integral representation and its relation to Trotter decompositions, numerical tools for the evaluation of path integrals will be discussed. In particular the path integral Monte Carlo method will be explained. To this end first a brief introduction into classical Monte Carlo computer simulations will be given. Some peculiarities one encounters when applied to path integrals will be high-lighted and a few simple worked out examples presented. Apart from the standard Metropolis method, also more advanced sampling techniques such as multigrid, staging and multicanonical methods will be introduced and briefly discussed.

The lectures will close with an outlook to related but more general quantum Monte Carlo algorithms.

Structure:

- I Review of path-integral formalism and classical Monte Carlo simulation method
- II Path integral Monte Carlo for simple examples
- III Advanced sampling methods and outlook to more general quantum Monte Carlo algorithms