Time integration of Tree Tensor Networks

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Time integration of high-dimensional problems, arising from the discretization of PDEs such as the Vlasov-Poisson equation of plasma physics and Schoedinger equation in many-body quantum mechanics, is a challenging numerical task: the total amount of information required to be stored and computed exceeds standard computational capacity. Time dependent model order reduction techniques are desirable.

In the present talk, dynamical low-rank approximation for matrices together with the matrix and the Tucker projector splitting integrator is introduced. Two remarkable properties of these integrators are presented, namely: the exactness property and the robustness with respect to small singular values. Then, the memory storage requirements for tensors in Tucker format are discussed and Tree Tensor Networks are introduced. Based upon a new compact formulation of the Tucker projector splitting integrator, the Recursive Tree Tensor Network integrator is presented.

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