Gauge invariance in a Z_2 hamiltonian lattice gauge theory

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Abstract: The Gauss law needs to be imposed on quantum states to guarantee gauge invariance when one studies gauge theory in hamiltonian formalism. In this work, we propose an efficient variational method based on the matrix product ansatz and apply it to a Z_2 lattice gauge theory on a spatial ladder chain. Gauge invariant low-lying states are identified by checking expectation values of the Gauss law operator after numerical diagonalization of the gauge hamiltonian. This is a preliminary work of its application to finite density and time-evolution calculations in lattice gauge theory.