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New algorithm for simulation of 3D classical spin glasses under the influence of external electromagnetic fields

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Abstract

We study statistical properties of 3D classical spin-glass under the influence of external fields. It is proved that in the framework of the nearest-neighboring model 3D spin-glass problem at performing of Birkhoff's ergodic hypothesis regarding to orientations of spins in the 3D space can be reduced to the problem of disordered 1D spatial spin-chains (SSC) ensemble where each spin-chain interacts with a random environment. The 1D SSC is defined as a periodic 1D lattice, where spins in nodes are randomly oriented in 3D space, in addition they all interact with each other randomly. For minimization of the Hamiltonian in an arbitrary node of the 1D lattice lattice, we obtained recurrent equations and corresponding Sylvester criterion, which allow to find energy local minimum. On the bases of these equations the

high-performance parallel algorithm is developed which allows to calculate all statistical parameters of 3D spin glass, including distribution of a constant of spin-spin interaction, from the first principles of the classical mechanics.

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