

Novel approaches in statistical physics

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In the given report the attention to use of a thermodynamic limit is paid at optimization problems research by methods of statistical physics [1]. In particular, in known minority game model [2,3] it is connected with treatment of parameter β/N , where β has a sense of inverse temperature, N is a number of dynamic variables (macroscopic). In papers [2,3] the given parameter is considered to be a small quantity and we expand in terms of it. That is how it is acted in problems of statistical physics. However, in an optimization problem where the limit β -infinity is considered only, such approach looks disputable. The given report presents the results of researches of an optimization problem in minority game model in gauss approach where expansion in terms of parameter β/N is not used directly. The point of the given approach is that at averaging over discrete variables in a replica method a transition to averaging over continuous variables with normal (gauss) distribution is carried out. As a result an effective Hamiltonian was received and the basic condition of system in space of dynamic variables was investigated. Calculations carried out in symmetric replica approach, and also with symmetry breaking replica. The received results are compared to the known approach from references.

1. Mantegna R.N., Stanley H.E., *An Introduction to Econophysics: Correlations and Complexity in Finance* (Cambridge University Press, 1999).
2. Challet D., Marsili M. and Zecchina R., Phys. Rev. Lett. 84, 1824 (2000) (cond-mat/9904392).
3. Challet D., Marsili M. and Zecchina R., Physica A 280, 522 (2000), (cond-mat/9901243).