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**ICANP2: Isoenergetic cluster algorithm for NP-complete Problems** ZHENG ZHU, CHAO FANG, HELMUT G. KATZGRABER, Texas AM University — NP-complete optimization problems with Boolean variables are of fundamental importance in computer science, mathematics and physics. Most notably, the minimization of general spin-glass-like Hamiltonians remains a difficult numerical task. There has been a great interest in designing efficient heuristics to solve these computationally difficult problems. Inspired by the rejection-free isoenergetic cluster algorithm developed for Ising spin glasses [Phys. Rev. Lett. 115, 077201 (2015)], we present a generalized cluster update that can be applied to different NP-complete optimization problems with Boolean variables. The cluster updates allow for a wide-spread sampling of phase space, thus speeding up optimization. By carefully tuning the pseudo-temperature (needed to randomize the configurations) of the problem, we show that the method can efficiently tackle problems on topologies with a large site-percolation threshold. We illustrate the ICANP2 heuristic on paradigmatic optimization problems, such as the satisfiability problem and the vertex cover problem.

Zheng Zhu  
Texas A  
M University

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