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Quantum Annealing for Constrained Optimization ITAY HEN, FEDERICO SPEDALIERI, Information Sciences institute, USC — Recent advances in quantum technology have led to the development and manufacturing of experimental programmable quantum annealers that could potentially solve certain quadratic unconstrained binary optimization problems faster than their classical analogues. The applicability of such devices for many theoretical and practical optimization problems, which are often constrained, is severely limited by the sparse, rigid layout of the devices' quantum bits. Traditionally, constraints are addressed by the addition of penalty terms to the Hamiltonian of the problem, which in turn requires prohibitively increasing physical resources while also restricting the dynamical range of the interactions. Here we propose a method for encoding constrained optimization problems on quantum annealers that eliminates the need for penalty terms and thereby removes many of the obstacles associated with the implementation of these. We argue the advantages of the proposed technique and illustrate its effectiveness. We then conclude by discussing the experimental feasibility of the suggested method as well as its potential to boost the encodability of other optimization problems.

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