Day 1 (Poster A)

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Title:Augmented Lagrangian Method for Constrained Optimization Problems in Quantum Annealing

Abstract:
To solve constrained optimization problems (COPs) by quantum annealing machines，the penalty method is widely used to incorporate the constraints into the Hamiltonian. In the penalty method，the constraint terms are introduced as quadratic penalty functions which take the minimum value only when the constraints are satisfied. They also have coefficients as parameters corresponding to each constraint to balance the strength of the penalty. However，when the problem has multiple constraints，finding the parameters which produces the feasible and better solutions becomes difficult. Usually，exhaustive search，such as grid search，is employed to find such parameters，however，it requires a number of iterations. To address this issue，we propose to use augmented Lagrangian method (ALM) for COPs in quantum annealing，which was originally developed for continuous COPs. ALM combines the quadratic penalty method and the multiplier method，and the parameters are updated sequentially. To study the efficacy of ALM for COPs in quantum annealing，we compared ALM with penalty method with COPs by using D-Wave 2000Q. As a result，we confirmed that ALM can find better solutions with less parameter updates than the penalty method. The work was done in collaboration with Shu Tanaka (Keio University).