Optimizing Quadratic Functions over the Vertex-Set of an Hypercube

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Abstract: Optimizing quadratic functions over the vertex-set of an hypercube (or generally, a rectangular box) is widely used to handle different technology and scientific models, ranging from Discrete Optimization to Constraint Satisfaction problems.In the present paper we shall investigate the problem in standard form:

$$\min f(x) = \frac{1}{2}x^T Qx + c^T x \quad (\max)$$

s.t

$$x_j \in \{-1, 1\}, j = 1, ..., n$$

where Q is an n-square symmetric matrix, c a vector in R^n, and propose a new algorithm to compute efficiently the maximum and minimum values of f over the vertex-set of the hypercube H:

$$x \in R^n : -1 \leq x_j \leq 1$$

Numerical test results and computational discussion are included in the paper.

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