TABOOS IN THE COMPUTATION OF THE EFFECTIVE GRAPH RESISTANCE

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The effective graph resistance is an effective measure for robustness of an undirected graph G. It is defined by considering the graph as an electric circuit with resistor of 1 Ohm at each edge. Kirchhoffs laws allow to calculate the potential difference per unit current for each pair of nodes. The effective graph resistance R_G is then the sum of the potential differences over all pairs of vertices.

Different characterisations of R_G exist. One is an expression in terms of the eigenvalues of the Laplacian L, which is the difference of degree and incidence matrix. Noticing that L is minus the q-matrix of a continuous time Markov process on the vertices, it appears that one may also compute R_G by considering the associated jump Markov chain. In particular, the potential difference $R(a, b)$ per unit current between vertices a and b can be calculated on basis of the taboo jump matrix in which either transitions to vertex a or vertex b are disabled. This gives rise to an efficient algorithm for computing tight upper and lower bounds for $R(a, b)$.