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SOME RESULTS ON MATRICES WITH RESPECT TO RESISTANCE DISTANCE

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Abstract. The resistance matrix $R = R(G)$ of G is a matrix whose (i,j)-th entry is equal to the resistance distance $r_G(v_i,v_j)$. The resistance $Re(v_i)$ of a vertex v_i is defined to be the sum of the resistance from v_i to all other vertices in G, i.e., $Re(v_i) = \sum_{j=1}^{n} r_G(v_i,v_j)$. The resistance signless Laplacian matrix of a connected graph G is defined to be $\mathcal{R}^Q = diag(Re)+R$, where $diag(Re)$ is the diagonal matrix of the vertex resistances in G. In this paper, we obtain upper bounds on the minimal and maximal entries of the principal eigenvector of $R(G)$ and $\mathcal{R}^Q$, respectively, and characterize the corresponding extremal graphs. In addition, a lower bound of the resistance (resp. resistance signless Laplacian) spectral radius of graphs with n vertices and independence number α is obtained, the corresponding extremal graph is also characterized.

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REFERENCES

[1] B. BOLLOBAS, *Morden Graph Theory*, Springer-verlag, 1998.
[2] KINKAR CH. DAS, CELSO M. DA SILVA JUNIOR, MARIA AGUIEIRAS A. DE FREITAS, RENATA R. DEL-VECCHIO, *Bounds on the entries of the principal eigenvector of the distance signless Laplacian matrix*, Linear Algebra and its Applications, 483 (2015) 200–220.
[3] A. D. GVISHIANI, V. A. GURVICH, *Metric and ultrametric spaces of resistances*, Russian Math. Surveys 42 (6 (258)) (1987) 235–236.
[4] D. KLEIN, M. RANDIĆ, *Resisitance distance*, J. Math. Chem. 12 (1993) 81–95.
[5] E. BOZZO, M. FRANCESCHET, *Resistance distance, closeness, and betweenness*, Social Networks 35 (2013) 460–469.
[6] H. CHEN, F. ZHANG, *Resistance distance and the nomalized Laplacian spectrum*, Dscrete Appl Math. 155 (2007) 654–661.
[7] J. ZHOU, Z. WANG, C. BU, *On the resistance matrix of a graph*, Electron. J. Combin. 23 (2016) ♯ P1.41.
[8] R. A. HORN, C. R. JOHNSON, *Matrix Analysis*, second edition, Cambridge University Press, 2012.
[9] W. XIAO, I. GUTMAN, *Resistance distance and Laplacian spectrum*, Theor. Chem. Acc. 110 (2003), 284–289.
[10] R. XING, B. ZHOU, *On the distance and distance signless Laplacian spectral radii of bicyclic graphs*, Linear Algebra Appl. 439 (2013) 3955–3963.
[11] H. MINC, *Nonnegative Matrices*, John Wiley Sons, New York, 1988.
[12] R. B. BAPAT, I. GUTMAN, W. XIAO, *A simple method for computing resistance distance*, Zeitschrift für Naturforschung A, 2003, 58 (9/10): 494–498.

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