

## BOUNDS FOR LAPLACIAN GRAPH EIGENVALUES

A. DILEK MADEN AND ŞERIFE BÜYÜKKÖSE

*Abstract.* Let  $G$  be a connected simple graph whose Laplacian eigenvalues are  $0 = \mu_n(G) \leq \mu_{n-1}(G) \leq \dots \leq \mu_1(G)$ . In this paper, we establish some upper and lower bounds for the algebraic connectivity and the largest Laplacian eigenvalue of  $G$ .

*Mathematics subject classification (2010):* 05C50, 15A18.

*Keywords and phrases:* algebraic connectivity, Laplacian eigenvalues, trace.

### REFERENCES

- [1] W. N. ANDERSON, T. D. MORLEY, *Eigenvalues of the Laplacian of a graph*, Linear Multilinear Algebra **18** (1985), 141–145.
- [2] D. TAŞCI Ş. BÜYÜKKÖSE, *Bounds for singular values using traces of matrices*, Selçuk University Art and Science Faculty, Journal of Science, Konya, Turkey **17** (2000), 137–146.
- [3] F. R. K. CHUNG, *Eigenvalues of Graphs*, In: Proceeding of the International Congress of Mathematician, Zürich, Switzerland, 1994, 1333–1342.
- [4] K. CH. DAS, *An improved upper bound for Laplacian graph eigenvalues*, Linear Algebra Appl. **368** (2003), 269–278.
- [5] M. FIEDLER, *Algebraic connectivity of graphs*, Czechoslovak Math. J. **23** (1973), 298–305.
- [6] J.-S. LI, X.-D. ZHANG, *A new upper bound for eigenvalues of the Laplacian matrix of a graph*, Linear Algebra Appl. **265** (1997), 93–100.
- [7] J.-S. LI, X.-D. ZHANG, *On Laplacian eigenvalues of a graph*, Linear Algebra Appl. **285** (1998), 305–307.
- [8] M. LU, L. ZHANG, F. TIAN, *Lower bounds of the Laplacian spectrum of graphs based on diameter*, Linear Algebra Appl. **420** (2007), 400–406.
- [9] R. MERRIS, *A note on Laplacian graph eigenvalues*, Linear Algebra Appl. **285** (1998), 33–35.
- [10] R. MERRIS, *Laplacian matrices of Graphs: a Survey*, Linear Algebra and its Applications **197** (1994), 143–176.
- [11] B. MOHAR, *The Laplacian spectrum of graphs*, In: Graph Theory, Combinatorics and Applications **2** (1998), 871–898.
- [12] O. ROJO O., R. SOTO, H. ROJO, *An always nontrivial upper bound for Laplacian graph eigenvalues*, Linear Algebra Appl. **312** (2000), 155–159.
- [13] X.-D. ZHANG, J.-S. LI, *On the  $k$ -th Largest Eigenvalue of the Laplacian Matrix of a Graph*, Acta Math. Appl. Sinica (English Ser.) **17**, 2 (2001), 183–190.