

ESTIMATES FOR THE NUMERICAL RADIUS OF $n \times n$ OPERATOR MATRICES

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Abstract. We present new upper bounds for the numerical radius of $n \times n$ operator matrices defined on a complex Hilbert space, i.e., operator matrices of the form $[T_{ij}]$, and illustrate with numerical examples that these bounds are better than the existing bounds.

Mathematics subject classification (2020): Primary 47A05, 47A12, 47A30.

Keywords and phrases: Numerical radius, operator matrices, spectral radius.

REFERENCES

- [1] M. E. OMIDVAR, H. R. MORADI, *Better bounds on the numerical radii of Hilbert space operators*, Linear Algebra Appl., 604 (2020), 265–277.
- [2] M. SABABHEH, H. R. MORADI, *More accurate numerical radius inequalities (I)*, Linear Multilinear Algebra, 2020, <https://doi.org/10.1080/03081087.2019.1651815>.
- [3] S. S. DRAGOMIR, *Some inequalities for the norm and the numerical radius of linear operators in Hilbert spaces*, Tamkang J. Math., 39 (1) (2008), 1–7.
- [4] W. BANI-DOMI AND F. KITTANEH, *Refined and generalized numerical radius inequalities for 2×2 operator matrices*, Linear Algebra Appl., 624 (2021), 364–386.
- [5] O. HIRZALLAH, F. KITTANEH, K. SHEBRAWI, *Numerical radius inequalities for certain 2×2 operator matrices*, Integr. Equ. Oper. Theory, 71 (2011), 129–147.
- [6] K. SHEBRAWI, *Numerical radius inequalities for certain 2×2 operator matrices II*, Linear Algebra Appl., 523 (2017), 1–12.
- [7] M. AL-DOLAT, I. JARADAT, I. AL-HUSBAN, *A novel numerical radius upper bound for 2×2 operator matrices*, Linear and Multilinear Algebra, (2020), 1–12,
<https://doi.org/10.1080/03081087.2020.1756199>.
- [8] T. YAMAZAKI, *On upper and lower bounds of the numerical radius and an equality condition*, Studia Math., 178 (2007), no. 1, 83–89.
- [9] J. C. HOU, H. K. DU, *Norm inequalities of positive operator matrices*, Integral Equations Operator Theory, 22 (1995), 281–294.
- [10] P. BHUNIA, S. BAG AND K. PAUL, *Numerical radius inequalities and its applications in estimation of zeros of polynomials*, Linear Algebra Appl., 573 (2019), 166–177.
- [11] H. GUELKEN AND F. KITTANEH, *On numerical radius inequalities for operator matrices*, Numer. Funct. Anal. Optim., 40 (2019), 1231–1241.
- [12] S. SAHOO, N. DAS, D. MISHRA, *Numerical radius inequalities for operator matrices*, Adv. Oper. Theory, 4 (1) (2019), 197–214.