

P-NUMERICAL RADIUS INEQUALITIES FOR 2×2 OPERATOR MATRICES

JUNLI SHEN, ERMING DING AND ALATANCANG CHEN

Abstract. In this paper, we present a refinement of the triangle inequality for Schatten p -norm, and specific example is given to compare our result with the triangle inequality for Schatten p -norm. As an application, a new lower bound for p -numerical radius is obtained. In addition, some bounds for p -numerical radius of 2×2 operator matrices are established, which extend the results of previous studies. Moreover, Schatten p -norm equalities of 2×2 operator matrices are also given.

Mathematics subject classification (2020): 47B20, 47A05.

Keywords and phrases: P -numerical radius, Schatten p -norm, inequality.

REFERENCES

- [1] A. ABU-OMAR, F. KITTANEH, *A generalization of the numerical radius*, Linear Algebra Appl. **569** (2019) 323–334.
- [2] S. AICI, A. FRAKIS, F. KITTANEH, *Further Hilbert-Schmidt numerical radius inequalities for 2×2 operator matrices*, Numer. Funct. Anal. Optim. **44** (5) (2023) 382–393.
- [3] A. ALDALABIH, F. KITTANEH, *Hilbert-Schmidt numerical radius inequalities for operator matrices*, Linear Algebra Appl. **581** (2019) 72–84.
- [4] F. ALRIMAWI, O. HIRZALLAH, F. KITTANEH, *Norm inequalities involving the weighed numerical radii of operators*, Linear Algebra Appl. **657** (2023) 127–146.
- [5] W. AUDEH, *Hilbert-Schmidt numerical radius inequalities for 2×2 operator matrices*, Int. J. Appl. Math. Comput. Sci. **16** (2021) 1161–1167.
- [6] O. AXELSSON, H. LU, B. POLMAN, *On the numerical radius of matrices and its application to iterative solution methods*, Linear Multilinear Algebra **37** (1994) 225–238.
- [7] N. BEBIANO, R. LEMOS, J. DA PROVIDEÑCIA, *Numerical ranges of unbounded operators arising in quantum physics*, Linear Algebra Appl. **381** (2004) 259–279.
- [8] R. BHATIA, *Matrix Analysis*, Springer, New York 1997.
- [9] R. BHATIA, F. KITTANEH, *Norm inequalities for partitioned operators and an application*, Math. Ann. **287** (1990) 719–726.
- [10] M. D. CHOI, D. W. KRIBS, K. ŹYCZKOWSKI, *Quantum error correcting codes from the compression formalism*, Rep. Math. Phys. **58** (2006) 77–91.
- [11] M. EIERMANN, *Field of values and iterative methods*, Linear Algebra Appl. **180** (1993) 167–197.
- [12] A. E. FARSSI, *Simple proof and refinement of Hermite-Hadamard inequality*, J. Math. Inequal. **4** (3) (2010) 365–369.
- [13] A. FRAKIS, F. KITTANEH, S. SOLTANI, *Upper and lower bounds for the p -numerical radii of operators*, Results Math. **79** (2) (2024) 1–13.
- [14] I. C. GOHBERG, M. G. KREIN, *Introduction to the Theory of Linear Nonselfadjoint Operators*, Translations of Mathematical Monographs, vol. 18, American Mathematical Society, Providence, RI, 1969.
- [15] M. HAJMOHAMADI, R. LASHKARIPOUR, *Some inequalities involving Hilbert-Schmidt numerical radius on 2×2 operator matrices*, Filomat **34** (14) (2020) 4649–4657.
- [16] J. HAMZA, H. ISSA, *Generalized numerical radius inequalities for Schatten p -norms*, arXiv:2204.02469.

- [17] C. K. LI, Y. T. POON, *Generalized numerical ranges and quantum error correction*, J. Oper. Theory **66** (2011) 335–351.
- [18] P. LIPKA-BARTOSIK, K. ŻYCZKOWSKI, *Nuclear numerical range and quantum error correction codes for non-unitary noise models*, Quantum Inf. Process **16** (2017) 9.
- [19] S. SAHOO, M. SABABHEH, *Hilbert-Schmidt numerical radius of block operators*, Filomat **35** (8) (2021) 2663–2678.
- [20] B. SIMON, *Trace Ideals and Their Applications*, Cambridge University Press, Cambridge, 1979.