Operators and Matrices
Volume 6, Number 1 (2012), 79–84

HIGHER RANK NUMERICAL HULLS OF MATRICES

ABBAS SALEMI

Abstract. For any $n \times n$ matrix A, we use the joint higher rank numerical range, $\Lambda_k(A,\dots,A^m)$, to define the *higher rank numerical hull* of A. We characterize the higher rank numerical hulls of Hermitian matrices. Also, the higher rank numerical hulls of unitary matrices are studied.

Mathematics subject classification (2010): 15A60,81P68.
Keywords and phrases: Higher rank numerical range, polynomial numerical hull, quantum computing, higher rank numerical hull.

REFERENCES

[1] MAN-DUEN CHOI, DAVID W. KRIBS, AND KAROL ŻYCZKOWSKI, *Quantum error correcting codes from the compression formalism*, Rep. Math. Phys. **58** (2006), 77–91.
[2] MAN-DUEN CHOI, JOHN A. HOLBROOK, DAVID W. KRIBS, AND KAROL ŻYCZKOWSKI, *Higher-rank Numerical Range of Unitary and Normal Matrices*, Operators and Matrices **1**, 3 (2007), 409–426.
[3] CHANDLER DAVIS AND ABBAS SALEMI, *On polynomial numerical hulls of normal matrices*, Linear Algebra Appl. **383** (2004), 151–161.
[4] CHANDLER DAVIS, CHI-KWONG LI AND ABBAS SALEMI, *Polynomial Numerical Hulls of Matrices*, Linear Algebra Appl. **428** (2008), 137–153
[5] ANNE GREENBAUM, *Generalizations of the field of values useful in the study of polynomial functions of a matrix*, Linear Algebra Appl. **347** (2002), 233–249.
[6] CHI-KWONG LI, YIU-TUNG POON AND NUNG-SING SZE, *Condition for the higher rank numerical range to be non-empty*, Linear and Multilinear Algebra **57** (2009), 365–368.
[7] CHI-KWONG LI AND NUNG-SING SZE, *Canonical forms, higher rank numerical ranges, totally isotropic subspaces, and matrix equations*, Proc. Amer. Math. Soc. **136** (2008), 3013–3023.
[8] OLAVI NEVANLINNA, *Convergence of iterations for linear equation*, Birkhäuser, Basel, 1993.
[9] HUGO J. WOERDEMAN, *The higher rank numerical range is convex*, Linear and Multilinear Algebra **56**, 1-2 (2008), 65–67.

Paper OaM-06-05