Mathematical
Inequalities
& Applications
Volume 18, Number 3 (2015), 1055–1078
doi:10.7153/mia-18-82

SOME GEOMETRIC PROPERTIES OF DIFFERENCE SEQUENCE SPACES OF ORDER m DERIVED BY GENERALIZED MEANS AND COMPACT OPERATORS

AMIT MAJI AND P. D. SRIVASTAVA

Abstract. We have introduced a new sequence space $l(r,s,t,p;\Delta^{(m)})$ combining by using generalized means and difference operator of order m. Some topological properties as well as geometric properties namely Banach-Saks property of type p and uniform Opial property have been studied. Furthermore, the α-, β-, γ- duals of this space are computed and also obtained necessary and sufficient conditions for some matrix transformations from $l(r,s,t,p;\Delta^{(m)})$ to l_∞, l_1. Finally, we obtained some identities or estimates for operator norms and measure of noncompactness of some matrix operators on the BK space $l_p(r,s,t;\Delta^{(m)})$ by applying the Hausdorff measure of noncompactness.

Mathematics subject classification (2010): 46A45, 46B15, 46B50.
Keywords and phrases: Difference operator, generalized means, matrix transformation, Hausdorff measure of noncompactness, compact operators.

REFERENCES

[1] B. ALTAY, F. BAŞAR, *On the paranormed Riesz sequence spaces of non-absolute type*, Southeast Asian Bull. Math., **26**, 5 (2003), 701–715.
[2] B. ALTAY, F. BAŞAR, *The fine spectrum and the matrix domain of the difference operator Δ on the sequence space l_p, $(0<p<1)$*, Commun. Math. Anal. **2**, 2 (2007), 1–11.
[3] C. AYDIN, F. BAŞAR, *Some new difference sequence spaces*, Appl. Math. Comput. **157**, 3 (2004), 677–693.
[4] F. BAŞAR, B. ALTAY, *Matrix mappings on the space $bs(p)$ and its α-, β-, γ-duals*, Aligarh Bull. Math. **21**, 1 (2002), 79–91.
[5] F. BAŞAR, B. ALTAY, *On the space of sequences of p-bounded variation and related matrix mappings*, Ukrainian Math. J. **55**, 1 (2003), 136–147.
[6] F. BAŞAR, B. ALTAY, M. MURSALEEN, *Some generalizations of the space bv_p of p-bounded variation sequences*, Nonlinear Anal. **68**, 2 (2008), 273–287.
[7] M. BAŞARIR AND E. E. KARA, *On some difference sequence spaces of weighted means and compact operators*, Ann. Funct. Anal, **2**, 2 (2011), 114–129.
[8] M. BAŞARIR, E. E. KARA, *On the mth order difference sequence space of generalized weighted mean and compact operators*, Acta Math. Sci. Ser. B Engl. Ed. **33**, 3 (2013), 797–813.
[9] M. BAŞARIR, E. E. KARA, S. KONCA, *On some new weighted Euler sequence spaces and compact operators*, Math. Inequal. Appl. **17**, 2 (2014), 649–664.
[10] R. ÇOLAK, M. ET, *On some generalized difference sequence spaces and related matrix transformations*, Hokkaido Math. J., **26**, 3 (1997), 483–492.
[11] Y. A. CUI AND H. HUDZIK, *Some geometric properties related to fixed point theory in Cesàro spaces*, Collect. Math., **50**, 3 (1999), 277–288.
[12] Y. A. CUI AND H. HUDZIK, *On the Banach-Saks and weak Banach-Saks properties of some Banach sequence spaces*, Acta Sci. Math. (Szeged), **65**, 1–2 (1999), 179–187.
[13] Y. A. CUI AND C. MENG, *Banach-Saks property and property (β) in Cesàro sequence spaces*, Southeast Asian Bull. Math., **24** (2000), 201–210.

Paper MIA-18-82

[14] S. DELPECH, *A short proof of Pitt's compactness theorem*, Proc. Amer. Math. Soc., **137**, 4 (2009), 1371–1372.
[15] I. DJOLOVIĆ, E. MALKOWSKY, *Matrix transformations and compact operators on some new mth-order difference sequence spaces*, Appl.Math.Comput. **198**, 2 (2008), 700–714.
[16] I. DJOLOVIĆ, E. MALKOWSKY, *A note on compact operators on matrix domains*, J. Math. Anal. Appl. **340**, 1 (2008), 291–303.
[17] I. DJOLOVIĆ, *On the space of bounded Euler difference sequences and some classes of compact operators*, Appl. Math. Comput. **182**, 2 (2006), 1803–1811.
[18] M. ET, M. KARAKAŞ, V. KARAKAYA, *Some geometric properties of a new difference sequence space defined by de la Vallée-Poussin mean*, Appl. Math. Comput. **234** (2014), 237–244.
[19] K.-G. GROSSE-ERDMANN, *Matrix transformations between the sequence spaces of Maddox*, J. Math. Anal. Appl. **180**, 1 (1993), 223–238.
[20] A. M. JARRAH, E. MALKOWSKY, *Ordinary, absolute and strong summability and matrix transformations*, Filomat **17** (2003), 59–78.
[21] H. HUDZIK, V. KARAKAYA, M. MURSALEEN, MOHAMMAD, N. ŞIMŞEK, *Banach-Saks type and Gurariĭ modulus of convexity of some Banach sequence spaces*, Abstr. Appl. Anal. 2014, Art. ID 427382, 9 pp.
[22] H. KIZMAZ, *On certain sequence spaces*, Canad. Math. Bull. **24**, 2 (1981), 169–176.
[23] I. J. MADDOX, *Paranormed sequence spaces generated by infinite matrices*, Proc. Cambridge Philos. Soc. **64** (1968) 335–340.
[24] A. MAJI, A. MANNA, P. D. SRIVASTAVA, *Some mth-order diference sequence spaces of generalized means and compact operators*, Ann. Funct. Anal., **6**, 1 (2015), 170–192.
[25] E. MALKOWSKY, V. RAKOČEVIĆ, *An introduction into the theory of sequence spaces and measure of noncompactness*, Zb. Rad. (Beogr.), **9** (17) (2000), 143–234.
[26] E. MALKOWSKY, V. RAKOČEVIĆ, *On matrix domains of triangles*, Appl. Math. Comput. **189** (2007), 1146–1163.
[27] E. MALKOWSKY, E. SAVAŞ, *Matrix transformations between sequence spaces of generalized weighted means*, Appl. Math. Comput., **147** (2004), 333–345.
[28] A. MANNA, A. MAJI, P. D. SRIVASTAVA, *Difference sequence spaces derived by using generalized means*, J. Egyptian Math. Soc, **23**, 1 (2015), 127–133.
[29] M. MURSALEEN, A. K. NOMAN, *Applications of the Hausdorff measure of noncompactness in some sequence spaces of weighted means*, Comput. Math. Appl., **60**, 5 (2010), 1245–1258.
[30] M. MURSALEEN, A. K. NOMAN, *On generalized means and some related sequence spaces*, Comput. Math. Appl. **61**, 4 (2011), 988–999.
[31] P. N. NG, P. Y. LEE, *Cesàro sequences spaces of non-absolute type*, Comment. Math. Prace Mat., **20**, 2 (1978), 429–433.
[32] N. PETROT, S. SUANTAI, *Uniform Opial properties in generalized Cesàro sequence spaces*, Nonlinear Anal. **63**, 8 (2005), 1116–1125.
[33] H. POLAT, F. BAŞAR, *Some Euler spaces of difference sequences of order m*, Acta Math. Sci. Ser. B Engl. Ed., **27B**, 2 (2007), 254–266.
[34] H. POLAT, V. KARAKAYA, N. ŞIMŞEK, *Difference sequence spaces derived by using a generalized weighted mean*, Appl. Math. Lett. **24**, 3 (2011), 608–614.
[35] S. PRUS, *Banach spaces with uniform Opial property*, Nonliner Anal. Theory Appl. **18**, 8 (1992), 697–704.
[36] N. ŞIMŞEK, V. KARAKAYA, *Structure and some geometric properties of generalized Cesàro sequence space*, Int. J. Contemp. Math. Sci. **3**, 5–8 (2008), 389–399.
[37] A. WILANSKY, *Summability through Functional Analysis*, North-Holland Math. Stud., **85**, Elsevier Science Publishers, Amsterdam, New York, Oxford, 1984.