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EXPLICIT CONSTRUCTION OF TIGHT NONUNIFORM FRAMELET PACKETS ON LOCAL FIELDS

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Abstract. The main objective of this paper is to provide the explicit construction of nonuniform tight framelet packets on local fields via wavelet spaces and NUMRA spaces.

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REFERENCES

[1] O. AHMAD AND N. A. SHEIKH, *On Characterization of nonuniform tight wavelet frames on local fields*, Anal. Theory Appl., **34** (2018) 135–146.
[2] B. BEHERA AND Q. JAHAN, *Wavelet packets and wavelet frame packets on local fields of positive characteristic*, J. Math. Anal. Appl. **395** (2012) 1–14.
[3] J. J. BENEDETTO AND R. L. BENEDETTO, *A wavelet theory for local fields and related groups*, J. Geom. Anal. **14** (2004) 423–456.
[4] O. CHRISTENSEN, *An Introduction to Frames and Riesz Bases*, Birkhäuser, Boston, 2003.
[5] D. CHEN, *On the splitting trick and wavelet frame packets*, SIAM J. Math. Anal. 4 (2000) 726–739.
[6] Q. J. CHEN, Z. X. CHENG, *A study on compactly supported orthogonal vector-valued wavelets and wavelet packets*, Chaos, Solitons and Fractals 31 (2007) 1024–1034.
[7] C. R. CHUI, C. LI, *Non-orthogonal wavelet packets*, SIAM J. Math. Anal. 24 (1993) 712–738.
[8] R. R. COIFMAN, Y. MEYER, M. V. WICKERHAUSER, *Size properties of wavelet packets*, In: M. B. Ruskai et al., eds., Wavelets and Their Applications, Jones and Bartlett, Boston, 1992, 453–470.
[9] R. R.COIFMAN, Y. MEYER, M. V. WICKERHAUSER, *Wavelet analysis and signal processing*, In: M. B. Ruskai et al., eds., Wavelets and Their Applications. Jones and Bartlett, Boston, 1992, 153–178.
[10] I. DAUBECHIES, B. HAN, A. RON AND Z. SHEN, *Framelets: MRA-based constructions of wavelet frames*, Appl. Comput. Harmon. Anal. **14** (2003) 1–46.
[11] I. DAUBECHIES, A. GROSSMANN, Y. MEYER, *Painless non-orthogonal expansions*, J. Math. Phys. **27** (5) (1986) 1271–1283.
[12] R. J. DUFFIN AND A. C. SHAEFFER, *A class of nonharmonic Fourier series*, Trans. Amer. Math. Soc. **72** (1952) 341–366.
[13] H. K. JIANG, D. F. LI AND N. JIN, *Multiresolution analysis on local fields*, J. Math. Anal. Appl. 294 (2004) 523–532.
[14] D. F. LI AND H. K. JIANG, *The necessary condition and sufficient conditions for wavelet frame on local fields*, J. Math. Anal. Appl. **345** (2008) 500–510.
[15] R. LONG, W. CHEN, *Wavelet basis packets and wavelet frame packets*, J. Fourier Anal. Appl. 3 (1997), 239–256.
[16] F. A. SHAH AND ABDULLAH, *Nonuniform multiresolution analysis on local fields of positive characteristic*, Complex Anal. Opert. Theory, **9** (2015) 1589–1608.
[17] F. A. SHAH AND O. AHMAD, *Wave packet systems on local fields*, Journal of Geometry and Physics, **120** (2017) 5–18.
[18] F. A. SHAH AND L. DEBNATH, *Tight wavelet frames on local fields*, Analysis, **33** (2013) 293–307.
[19] F. A. SHAH, O. AHMAD AND P. E. JORGENSON, *Fractional Wave Packet Frames in* $L^2(\mathbb{R})$, Journal of Mathematical Physics, 59, 073509 (2018); doi:10.1063/1.5047649.

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[20] F. A. SHAH AND M. Y. BHAT, *Tight framelet packets on local fields of positive characteristic*, J. Classical Anal. **6** (2015) 85–101.
[21] Z. SHEN, *Nontensor product wavelet packets in* $L^2(\mathbb{R}^s)$, SIAM J. Math. Anal. 26 (1995) 1061–1074.
[22] M. H. TAIBLESON, *Fourier Analysis on Local Fields*, Princeton University Press, Princeton, NJ, 1975.
[23] R. YOUNG, *An introduction to nonharmonic Fourier series*, Academic Press, New York, 1980 (revised first edition 2001).