THE WAVELET TRANSFORM RELATED TO THE JACOBI–CHEREDNIK OPERATOR AND ITS APPLICATIONS

Anirudha Poria[1,*], Abdelaali Dades[2]

[1] *Department of Applied Mathematics, School of Mathematics and Physics, Xi'an Jiaotong-Liverpool University, Suzhou, China*
[2] *Laboratory of Fundamental and Applied Mathematics, Department of Mathematics, Faculty of Sciences Aïn Chock, University Hassan II, Casablanca, Morocco*

ABSTRACT

In this paper, we introduce the wavelet transform associated with the Jacobi–Cherednik operator. We first present some basic properties of the Opdam–Cherednik wavelet transform. Then, we establish a few versions of the uncertainty principle for this transform. Also, we show that the Opdam–Cherednik convolution operator is a time-invariant filter and give a physical interpretation of a time-invariant filter. As an application, we discuss a signal recovery problem using uncertainty principles and show that the reconstruction of a transmitted signal from a noisy received signal is possible using the uncertainty principle for the Opdam–Cherednik wavelet transform. Finally, we solve the Fredholm-type integral equation using the time-invariant filter for this transform.

***K*eywords** Opdam–Cherednik wavelet transform · Uncertainty principles · Signal recovery · Time-invariant filter · Fredholm integral equation

References

[1] Anker J.-P., Ayadi F., and Sifi M., Opdam's hypergeometric functions: product formula and convolution structure in dimension 1, Adv Pure Appl Math. 3(1): 11–44, 2012.

[2] Boggess A., and Narcowich F.J., A first course in wavelets with Fourier analysis, 2nd ed., John Wiley & Sons, Hoboken, NJ, 2009.

[3] Mondal S.S., and Poria A., Uncertainty principles for the windowed Opdam–Cherednik transform, Math Meth Appl Sci. 46(18): 18861–18877, 2023.

[4] Schapira B., Contributions to the hypergeometric function theory of Heckman and Opdam: sharp estimates, Schwartz space, heat kernel, Geom Funct Anal. 18: 222–250, 2008.

[*] *Corresponding Author's E-mail: Anirudha.Poria@xjtlu.edu.cn*