



Multiresolution analysis for linear canonical S transform

M. Younus Bhat¹ · Aamir H. Dar¹

Received: 27 June 2021 / Accepted: 14 September 2021 / Published online: 4 October 2021
© Tusi Mathematical Research Group (TMRG) 2021

Abstract

To deal with the time-varying signals, linear canonical S transform (LCST) is introduced to possess some desirable characteristics that are absent in conventional time–frequency transforms. Inspired by LCST, we in this paper developed an idea of novel MRA associated with LCST. Moreover, the construction method of orthogonal wavelets is developed. Finally an example is provided to justify the results.

Keywords Linear canonical S transform · Scaling function · Multiresolution analysis · Orthogonality

Mathematics Subject Classification 42C40 · 42C15 · 43A70 · 11S85 · 47G10

1 Introduction

The Stockwell transform mostly known as S transform (ST) was studied by Stockwell et al. in [9]:

$$S[f](\xi, \zeta) = \int_{-\infty}^{\infty} f(t) \frac{|v|}{\sqrt{2\pi}} e^{-\frac{|t-\zeta|^2 \zeta^2}{2}} e^{-i2\pi \xi t} dt \quad (1)$$

The ST is unique in nature as it provides frequency-dependent resolution while maintaining a direct relationship with the Fourier spectrum. Due to this reason it has

Communicated by Kenneth Berenhaut.

✉ M. Younus Bhat
gyounus@gmail.com
Aamir H. Dar
ahdkul740@gmail.com

¹ Department of Mathematical Sciences, Islamic University of Science and Technology
Awantipora, Pulwama 192122, Jammu and Kashmir, India