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ON CONVOLUTION OF BOAS TRANSFORM OF WAVELETS

NIKHIL KHANNA† AND LEENA KATHURIA

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Abstract. In this paper, we show that the Boas transform of Convolution (cross-correlation) of two wavelets satisfies the required admissibility and regularity conditions. These resulting new wavelets are then employed to analyze Boas transform of convolved (cross-correlated) signals by means of Boas transform wavelet convolution and cross-correlation theorems. Analogously to Bedrosian theorem, Boas transform product theorem is given.

1. Introduction

Boas [2] introduced an integral transform associated to the Hilbert transform, which emerged due to the study of the class of functions having Fourier transform, which vanishes on a finite interval. This transform was known by Boas transform, which finds an application in the theory of filters in electrical engineering. A filter is a system, having some frequency selective mechanism. Recall from [30], that the system transfer function of a high pass filter is given by $H(w) = \begin{cases} Ae^{it_o w}, & \text{if } |w| \geq 1; \\ 0, & \text{otherwise} \end{cases}$. Thus, any finite energy signal f passing through a high pass filter gives an output g such that $\hat{g}(w) = H(w)\ \hat{f}(w)$. Thus, $\hat{g}$ vanishes on $(-1, 1)$. Using Boas' theorems, one can characterize the output of the high pass filter in two ways: (i) a signal g is the output of a high pass filter if and only if $\mathcal{B}(\mathcal{B}g) = -g$, (ii) if g is an output of high pass filter, then $\mathcal{B}g = \mathcal{H}g$. Boas transform was further studied by Goldberg [8], Heywood [10] and Zaidi [29]. For various details related to Boas transform, one may refer to [30] and see [19] for details on Hilbert transform. The wavelet transform finds a significant

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†Corresponding author.