Continuous Wavelet Transforms with Applications to Analyzing Functions on Spheres

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Abstract

In this paper, the continuous wavelet transforms on $L^2(\mathbb{R})$ and $L^2(\mathbb{R}^2)$ are generalized to tangent bundles of spheres, namely to TS^1 and TS^2. We consider specific groups that admit square–integrable representations in $L^2(TS^1)$ and $L^2(TS^2)$, respectively. Under the action of these groups, points in the fibers are scaled and translated whereas points in the underlying manifolds are only translated. Modified versions of these groups can be used to define the generalized wavelet transforms. We give some applications of our construction to the study of functions on S^1 and S^2 themselves.

Key Words: Wavelet transforms, square–integrable representations, tangent bundles, homogeneous spaces.

AMS Subject Classifications: 22D10, 55R25.

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