Hyperbolic wavelet analysis of anisotropic textures : global regularity and multifractal formalism.

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Anisotropic images -that is images having different geometric characteristics along different directions - naturally appear in various areas (biomedical, hydrology, geostatistics and spatial statistics...) and in many applications, the detection and characterization of the anisotropy is an important issue. We prove that, up to the lost of a logarithmic correction on the wavelet size estimates, the hyperbolic wavelet basis -which is not taylored to one particular anisotropy - gives characterizations of anisotropic Besov spaces $B^{s,\alpha}_{p,q}(\mathbb{R}^2)$. This result leads to an efficient algorithm to detect global anisotropic characteristics, that we have tested, among others, on anisotropic gaussian fields (OSGRF). A similar result is shown for anisotropic pointwise regularity. Further, we relate local regularity features to global quantities on the hyperbolic wavelet coefficients of the analyzed texture. We then pave the way to a new multifractal attributes for images, allowing to describe simultaneously possible complex scales invariances properties and anisotropic characteristics.