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Multiscale analysis of depth images from natural scenes: Scaling in the depth of the woods

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Résumé en anglais	We analyze an ensemble of images from outdoor natural scenes and consisting of pairs of a standard gray-level luminance image associated with a depth image of the same scene, delivered by a recently introduced low-cost sensor for joint imaging of depth and luminance. We specially focus on statistical analysis of multiscale and fractal properties in the natural images. Two methodologies are implemented for this purpose, and examining the distribution of contrast upon coarse-graining at increasing scales, and the orientationally averaged power spectrum tied to spatial frequencies. Both methodologies confirm, on another independent dataset here, the presence of fractal scale invariance in the luminance natural images, as previously reported. Both methodologies here also reveal the presence of fractal scale invariance in the novel data formed by depth images from natural scenes. The multiscale analysis is confronted on luminance images and on the novel depth images together with an analysis of their statistical correlation. The results, especially the new results on the multiscale analysis of depth images, consolidate the importance and extend the multiplicity of aspects of self-similarity and fractal scale invariance properties observable in the constitution of images from natural scenes. Such results are useful to better understanding and modeling of the (multiscale) structure of images from natural scenes, with relevance to image processing algorithms and to visual perception. The approach also contains potentialities for the fractal characterization of three-dimensional natural structures and their interaction with light.
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[2] http://okina.univ-angers.fr/etienne.belin/publications
[3] http://okina.univ-angers.fr/publications?f[author]=1901
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