

# TEXTURE MODELING: SELF-SIMILAR GAUSSIAN FIELDS AND MONOGENIC SIGNAL

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**Abstract.** Self-similarity refers to an object that maintains the same properties at different scales. This notion is particularly adapted to the analysis of micro-textures, which do not present any geometrical structure or pattern, and are usually modeled by a Gaussian random field. In medical imaging, for example, modeling a texture given by mammography using a self-similar random field, and studying its self-similarity order, allows to distinguish between dense or fatty breast tissue. Here we are interested in anisotropic self-similar random fields with stationary increments. To analyze these random fields, we propose to use the monogenic signal, defined from the Riesz transform, the 2-D analog of the Hilbert transform. Given an anisotropic Gaussian field, studying the associated monogenic signal can provide an estimation of its directionality or its degree of anisotropy. Following the work of Polissano et al. (2017) we propose an analysis based on a multiscale monogenic decomposition to estimate the self-similarity parameter and the degree of anisotropy of a special case of such fields: elementary fields. The parameters obtained from the multiscale monogenic transform allow to characterize precisely these random fields. We study theoretically and numerically the statistical performances of these estimators.