

Hard-core thinnings of germ–grain models with power-law grain sizes

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Abstract:

Random sets with long-range dependence can be generated using a Boolean model with power-law grain sizes. We study thinnings of such Boolean models which have the hard-core property that no grains overlap in the resulting germ–grain model. A fundamental question is whether long-range dependence is preserved under such thinnings. To answer this question we study four natural thinnings of a Poisson germ–grain model where the grains are spheres with a regularly varying size distribution. We show that a thinning which favors large grains preserves the slow correlation decay of the original model, whereas a thinning which favors small grains does not. Our most interesting finding concerns the case where only disjoint grains are retained, which corresponds to the well-known Matérn type I thinning. In the resulting germ–grain model, typical grains have exponentially small sizes, but rather surprisingly, the long-range dependence property is still present. As a byproduct, we obtain new mechanisms for generating homogeneous and isotropic random point configurations having a power-law correlation decay.

(This talk is based on the paper Hard-core thinnings of germ–grain models with power-law grain sizes (<http://arxiv.org/abs/1204.1208>), joint work with Lasse Leskelä, University of Jyväskylä.)