20th Workshop on Stochastic Geometry, Stereology and Image Analysis

2–7 June, 2019, Sandbjerg Estate, Denmark

Abstract

Jürgen Kampf

The variances of surface area estimators based on pixel configuration counts

In this talk we deal with the estimation of the surface area of sets of which only a pixel image is observed. So-called *local algorithms* are quite popular, since they are computationally fast and easy to implement. These algorithms count the number of occurrences of small patters, called *pixel configurations*, in the image and estimate the surface area of the underlying set by a linear combination of these counts.

The asymptotic relative biases of local algorithms for the surface area in $\mathbb{R}^3$ have been investigated by Ziegel and Kiderlen, when the underlying set is shifted at random and the lattice distance tends to zero.

But the bias is only one component of the error. The other component – the variance – has not been considered so far. In this talk we will show that under the setup described above the variance tends to zero of quadratic order and thus is neglectable compared to the bias.

In order to prove this result we derive deterministic upper and lower bounds for the number of occurrences of the pixel configurations in pixel images of sufficiently regular sets. These bounds are close to each other, which implies that the variances of these counts are small and thus that the variance of the surface area estimator is small.