

Comment to “Modern statistics for spatial point processes” by Jesper Møller and Rasmus Waagepetersen

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This paper presents a wealth of powerful methods and I would like to congratulate the authors on their excellent work. However, it will take time for the methods to become widely used in the sciences. Additionally to the didactically well-chosen examples of the authors, more instructive examples are needed. And these examples could be analysed more thorough, as I explain here for the rain forest data.

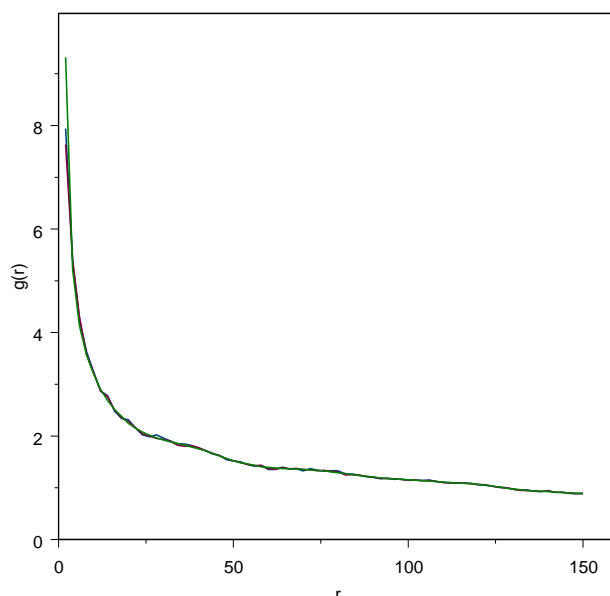


Figure 1: Empirical pair correlation function for the whole $1000 \times 500 \text{ m}^2$ rain forest pattern, obtained with bandwidths 0.5, 1.2 and 5 m.

Already visual inspection of Fig. 2 shows that it is a clustered pattern, no K -function is necessary to come to this conclusion. The important problem of determining the range of correlation r_{corr} is not discussed, which is perhaps impossible by means of the K -function as shown in Fig. 9. Assuming stationarity I calculated the pair correlation function (p. c. f.) for the bandwidths $h = 0.5, 1.2$ and 5 m, see Figure 1. The three estimates practically coincide and suggest a $r_{\text{corr}} \approx 150 \text{ m}$, which may correspond to a cluster diameter of 300 m. This scale may correspond to local interaction between plants and environment. By the way, an argument as that of the authors against p. c. f. estimation could favour the empirical distribution function over histograms, as these are “sensitive to the choice of” the class interval length. To my surprise, the estimates

$\hat{\sigma} = 1.33$ and $\hat{\alpha} = 34.7$ given in Section 8.2 used for a stationary log Gaussian Cox process yield a very good approximation of the empirical p.c.f.

If stationarity for the pattern is not assumed, both $\hat{K}(r)$ in Fig. 9 and my $\hat{g}(r)$ tell only little about interaction among trees, since these estimates result from averaging over the whole window. Therefore subwindows should be considered. Of particular interest are ‘quasi-homogeneous’ subwindows, which resemble research plots of foresters in some way. They give information on local interaction of points, with reduced influence of covariates. I considered the two subwindows $W_1 = [560, 680] \times [0, 120]$ and $W_2 = [580, 760] \times [180, 410]$. The corresponding intensities and (local) p. c. f.’s differ greatly, as shown in Figure 2. While for W_1 clustering is indicated, the pattern in W_2 seems to be close to CSR. The estimated r_{corr} are 20 m and 5 m, respectively, marking the scale of local interaction between single trees resulting from the individuals’ size and dispersal. The different results for W_1 and W_2 seem to reveal that the assumption of second order reweighted stationarity may not hold with the given window or is not better than the stationarity assumption. I miss in the paper any discussion of the validity of the s.o.r.s. assumption.

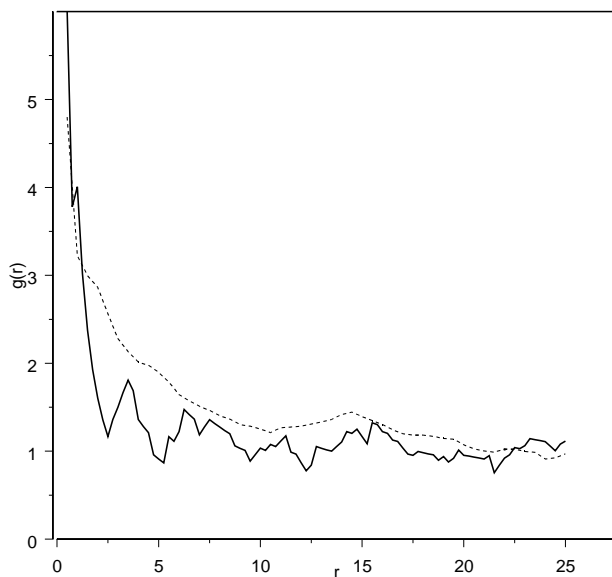


Figure 2: Empirical pair correlation functions for two subwindows of the $1000 \times 500 \text{ m}^2$ window (described in the text), $\cdots = W_1$, $\text{—} = W_2$. The bandwidths are 1 m for W_1 and 3 m for W_2 , corresponding to the point densities.

Finally, I doubt that point process statistics is the right approach for treating the “question whether the intensity of the trees may be viewed as a spatially varying function of the covariates”. I would recommend a geostatistical approach using a

constructed regionalized variable $Z(x)$ with $x \in \mathbb{R}^2$. A possible form is

$$Z(x) = N(b(x, R)),$$

i.e. $Z(x)$ is the number of points in the disk of radius R centred at x . I calculated the variogram for $R = 12.5$ m using a 25×25 m² lattice of 800 points. It looks like an empirical variogram as often observed in geostatistical studies and suggests $r_{\text{corr}} \approx 500$ m, see Figure 3. This scale seems to correspond to the variability of the covariates shown in Fig. 3.

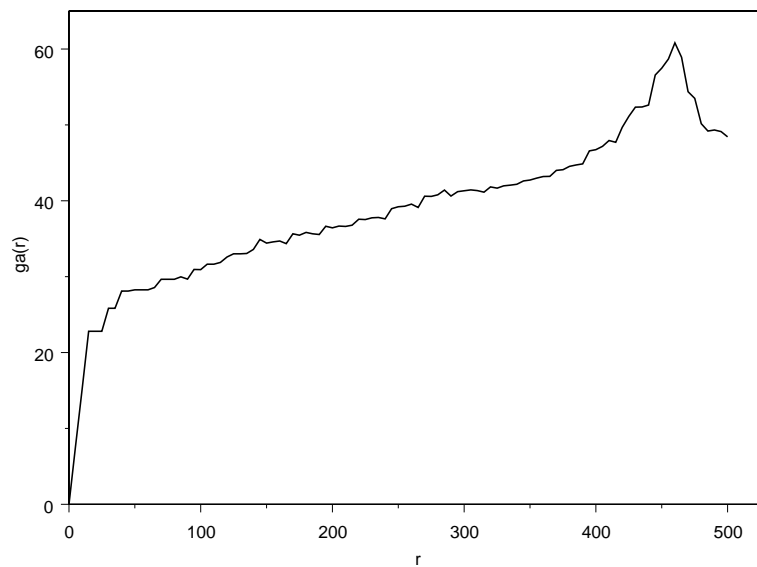


Figure 3: Empirical variogram for the constructed random field $\{Z(x)\}$ as explained in the text. The radius r was chosen as 12.5 m, for the computation a 25×25 m² lattice of 800 points was used.

D.S. thanks Dr. Janine Illian and Dr. Arne Pommerening for helpful discussions on ecological aspects of the paper.