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**Bayesian wombling for spatial point processes.** (English) Zbl 1180.62175  
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Summary: In many applications involving geographically indexed data, interest focuses on identifying regions of rapid change in the spatial surface, or the related problem of construction or testing of boundaries separating regions with markedly different observed values of the spatial variable. This process is often referred to in the literature as boundary analysis or wombling. Recent developments in hierarchical models for point-referenced (geostatistical) and areal (lattice) data have led to corresponding statistical wombling methods, but there does not appear to be any literature on the subject in the point-process case, where the locations themselves are assumed to be random and likelihood evaluation is notoriously difficult.

We extend existing point-level and areal wombling tools to this case, obtaining full posterior inference for multivariate spatial random effects that, when mapped, can help suggest spatial covariates still missing from the model. In the areal case we can also construct wombled maps showing significant boundaries in the fitted intensity surface, while the point-referenced formulation permits testing the significance of a postulated boundary. In the computationally demanding point-referenced case, our algorithm combines Monte Carlo approximants to the likelihood with a predictive process step to reduce the dimension of the problem to a manageable size. We apply these techniques to an analysis of colorectal and prostate cancer data from the northern half of Minnesota, where a key substantive concern is possible similarities in their spatial patterns, and whether they are affected by each patient's distance to facilities likely to offer helpful cancer screening options.

**MSC:**

- [62P10](#) Applications of statistics to biology and medical sciences; meta analysis Cited in 6 Documents
- [62F15](#) Bayesian inference
- [62M99](#) Inference from stochastic processes
- [60G55](#) Point processes (e.g., Poisson, Cox, Hawkes processes)
- [65C60](#) Computational problems in statistics (MSC2010)
- [92C50](#) Medical applications (general)

**Keywords:**

[Bayesian](#); [cancer](#); [spatial point process](#); [wombling](#)

**Full Text:** [DOI](#)

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