Estimating the intensity function of spatial point processes outside the observation window

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Mapping the intensity of objects, as animal or plant species in ecological studies, is cumbersome as soon as these objects are not accessible by automated methods. The knowledge at large scale of the underlying process variability can then only be obtained through sampling and spatial prediction. Here, we aim to predict the intensity of a point process, at locations where it has not been observed, conditional to the observation using the best linear unbiased combination of the point process realization in the observation window. We show that the weight function associated to the predictor is the solution of a Fredholm equation of second kind. Both the kernel and the source term of the Fredholm equation are related to the second order characteristics of the point process through the pair correlation function. We propose here two approximations to solve the Fredholm equation in order to obtain practical solutions and restrict the solution space to that generated by linear combinations of basis functions : step functions, which lead to a direct solution (Gabriel et al, 2016) and splines, which provide a continuous approximation. Results will be illustrated on simulations and real data (California earthquakes and Montagu's Harriers' nest locations).

Gabriel E., Bonneu F., Monestiez P., Chadoeuf J. (2016) Adapted kriging to predict the intensity of partially observed point process data, *Spatial Statistics*, (18)54–71.