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A REVIEW ON INHOMOGENEOUS MARKOV POINT PROCESSES

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Abstract

Recent models for inhomogeneous spatial point processes with interaction are reviewed. The focus is on models derived from homogeneous Markov point processes. For some of the models, the interaction is location dependent. A new type of transformation related model with this property is also suggested. The statistical inference based on likelihood and pseudolikelihood is discussed for the different models. In particular, it is shown that for transformation models, the pseudolikelihood function can be decomposed in a similar fashion as the likelihood function.

Keywords: Cox point processes, Gibbs point processes, inhomogeneity, interaction, likelihood, Markov point processes, Papangelou conditional intensity, Poisson point processes, pseudolikelihood, thinning, transformation

1 Introduction

In recent years, models for inhomogeneous point processes with interaction have been suggested by several authors. We will in the present paper concentrate on three ways of introducing inhomogeneity into a Markov model, i.e. inhomogeneity induced by a non-constant first-order interaction (Stoyan and Stoyan (1998); see also Ogata and Tanemura (1986)), by thinning of a homogeneous Markov point process (Baddeley et al. (2000)) and by transformation of a homogeneous Markov point process (Jensen and Nielsen (2000)). The aim is to give a unified exposition of these models in order to be able to assess their relative merits and point to research problems that remain to be solved in this area.

We restrict attention to finite point processes. For any of the three point process models to be considered, the inhomogeneity may be described by a function λ defined on the same set as the points. In the case where the