A Simulation Study of Statistical Inference in Non-homogeneous Poisson Processes with Emphasis on Frailty and Dynamic Behavior

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A study of recurrent events for repairable systems is presented. The basic model is the nonhomogeneous Poisson process with power law intensity function. When several similar systems are under observation, the assumption that the corresponding processes are independent and identically distributed is often questionable. In practice there may be an unobserved heterogeneity among the systems. We consider two seemingly different approaches for analysis of such differences, namely by using frailties and by using dynamic models. The relation between the two approaches is investigated, both theoretically and in a simulation study. Detailed derivations of likelihood functions are provided, and maximum likelihood is used as the inference tool. A possible conclusion is that the two approaches are very similar, so that frailty models may be viewed as an alternative to dynamic models.

Keywords: Recurrent events, Repariable systems, Power law model, Fraility, Dynamic modeling.