MODELING TELETRAFFIC ARRIVALS BY A POISSON CLUSTER PROCESS

BÁRBARA GONZÁLEZ-ARÉVALO (JOINT WORK WITH T. MIKOSCH AND G. SAMORODNITSKY)

ABSTRACT. In this paper we consider a Poisson cluster process N as a generating process for the arrivals of packets to a server. This process generalizes in a more realistic way the infinite source Poisson model which has been used for modeling teletraffic for a long time. At each Poisson point Γ_j, a flow of packets is initiated which is modeled as a partial iid sum process $\Gamma_j + \sum_{i=1}^{k} X_{ji}$, $k \le K_j$, with a random limit K_j which is independent of (X_{ji}) and the underlying Poisson points (Γ_j). We study the covariance structure of the increment process of N. In particular, the covariance function of the increment process is not summable if the right tail $P(K_j > x)$ is regularly varying with index $\alpha \in (1, 2)$, the distribution of the X_{ji}'s being irrelevant. This means that the increment process exhibits long-range dependence. If $\mathrm{var}(K_j) < \infty$ long-range dependence is excluded. We study the asymptotic behavior of the process $(N(t))_{t\ge 0}$ and give conditions on the distribution of K_j and X_{ji} under which the random sums $\sum_{i=1}^{K_j} X_{ji}$ have a regularly varying tail. Using the form of the distribution of the interarrival times of the process N under the Palm distribution, we also conduct an exploratory statistical analysis of simulated data and of Internet packet arrivals to a server. We illustrate how the theoretical results can be used to detect distributional characteristics of K_j, X_{ji}, and of the Poisson process.

MATHEMATICS DEPARTMENT, UNIVERSITY OF LOUISIANA AT LAFAYETTE, 217 MAXIM D. DOUCET HALL, P.O.BOX 41010, LAFAYETTE, LA 70504-1010, U.S.A.

E-mail address: barbara@louisiana.edu