STANFORD UNIVERSITY

DEPARTMENT OF STATISTICS

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Point-Stationarity

Let N^o be the Palm version of a stationary Poisson process N in R^d, that is, N^o has the same distribution as $N+\delta_0$. Consider the following problem: when $d > 1$, is there some non-randomized way of shifting the origin of N^o from the point at the origin to another point T so that the distribution of N^o does not change?

This is clearly possible when $d = 1$, since then the intervals between points are i.i.d. exponential and remain so when the origin is shifted to the nth point on the right (or on the left) of the point at the origin. And when $d > 1$, it is shown in Thorisson (2000) that such a T - with $P(T0)$ arbitrarily close to 1, - exists if external randomization is allowed. But is there a strictly non-zero non-randomized T?

We shall show that the answer is yes. There is actually a sequence $(T_n : n \in Z)$ of such points, and for $d = 2$ and $d = 3$ this sequence strings up the points of N^o.

If we go beyond the Poisson case, a more general problem concerns the concept of "point-stationarity". Intuitively, point-stationarity means that the behaviour of a point process N^o relative to a given point of the process is independent of the point selected as origin. Formally, this concept is defined in Thorisson (2000) to be distributional invariance under bijective point-shifts "against any independent stationary background" and shown to be the characterizing property of the Palm version N^o of any stationary point process N in R^d. A natural question is whether the definition of "point-stationarity" can be reduced to distributional invariance under non-randomized bijective point-shifts. An approach to this problem will be outlined.

Reference:

Thorisson, H. (2000). Coupling, Stationarity, and Regeneration. Springer, NY.