Wilfrid S. Kendall

Scale-invariant Random Spatial Networks (SIRSN) from line patterns.

Aspects of this work have been carried out in collaboration with David Aldous, Sayan Banerjee, and Rodolfo Gameros

It is possible to join up all pairs of planar points by using paths based on a variant of a Poisson line pattern which is dense everywhere, but with speed limits on the lines such that lines with speeds exceeding v form a Poisson line process with density depending on v. Remarkably, this can be done so that:
(a) any point can be reached from any other point in finite mean time, with fastest connection which is unique for almost all pairs of points,
(b) the pattern formed by shortest-time connections between a finite set of points is scale-invariant,
(c) the pattern of shortest-time connections between points of an independent Poisson point process has finite mean length intensity.
In short, the resulting structure is a SIRSN [3, 4]. I will survey the work which establishes all this, and discuss relevance to evaluation of spatial networks, traffic in spatial networks [1, 2], and qualitative behaviour of shortest-time paths.

References:

1. WSK. Geodesics and flows in a Poissonian city. Ann. Appl. Prob., 21 (2011), no. 3, 801-842.

2. WSK. Return to the Poissonian City. J. Appl. Prob (2014), 15A, 297-309.

3. WSK (2016). From Random Lines to Metric Spaces. Ann. Prob. (to appear), 46pp.

4. Kahn, J. (2016). Improper poisson line process as SIRSN in any dimension. Ann. Prob. (to appear).