Algorithms to estimate the rose of directions of a spatial fibre system

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Abstract

The directional measure (which is up to normalization the rose of directions) is used to quantify anisotropy of stationary fibre processes in three-dimensional space. There exist a large number of approaches to estimate this measure from the rose of intersections (which is the mean number of intersections of fibres with lower dimensional test sets). Three recently suggested nonparametric algorithms to solve this problem are reviewed and compared. They were obtained from solutions of a least squares problem, a more general convex optimization problem and a linear program, respectively. Application to two different carbon fibre architectures and to simulated data allow an empirical comparison of these approaches. In addition, estimators for the associated zonoid (or Steiner compact) are suggested. This set turns out to be an intuitive tool for visualization.