

# Species Mingling and Diameter Differentiation as Second-Order Characteristics

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## ABSTRACT

Spatial forest structure research can be considered as a special branch or application of point process statistics and therefore ties into general concepts and theories. According to them, species mingling and diameter differentiation indices, also referred to as nearest neighbour summary characteristics (NNSS), are based on constructed marks. Interestingly the construction principles of marks share similarities with the principles of the construction of test functions of second-order characteristics. By defining species mingling and diameter differentiation as second-order characteristics the authors showed that successful concepts of structural indices can indeed be transferred to other, more powerful statistical concepts. The new mark mingling and mark differentiation functions were then applied to Poisson point processes with independent and dependent marking and also to marked point pattern data from two forests. The analyses clearly highlighted that the new second-order characteristics, which are based on the same principles of comparing tree attributes as the traditional indices, significantly add to the value of the simple mark distributions. This compatibility of mark and test function construction works both ways and the principles of the test functions of the mark correlation function and the mark variogram can for example be used to construct mark correlation and mark variogram indices as NNSS. This provides the analyst with the flexibility to use second-order characteristics if large observation windows with more than 100 points are available and the corresponding mark or index distributions in the case of small observation windows with only few points, a common situation in forest inventory. And yet, the algorithmic principles of comparing tree attributes are then the same.