Spatial structure: a way to understand the dynamics and to model the growth of mixed stands.

Our aim is to show how spatial structure analysis can be used to improve our knowledge of heterogeneous forest and to provide some perspectives for their modelling.

We used the cartography of 25 1ha plots in Orléans forest (1) to analyse the spatial structure (2) and to build a typology of Sessile oak-Scots pine mixed stands. This typology helped us to better understand the influence of the different processes of the dynamics (3). Moreover, we will use this typology to build a model of spatial structure and simulate realistic initial conditions for growth models (4).

Spatial structure analysis...  
Regeneration  
Soil heterogeneity  
Aggregated structure  
Inter specifics repulsion  
Past silviculture  
Inter specifics competition  

Spatial structure (organization of trees in space)  
Biological processes; silviculture  
Local neighbourhood of each tree

The observed spatial structure results from past biological processes and in return it defines the variety of local neighbourhoods of each tree, which influence future processes such as competition and mortality. Consequently, spatial structure analysis could be used in order to infer some information on the biological processes involved in the growth and the dynamics of heterogeneous stands.

The model of structure will allow to simulate realistic virtual stands in coherence with the different types of the typology. Virtual stand will be simulated with point processes, specific statistical tools that generate point patterns.

Such realistic virtual stands will be used as initial states for simulations with individual based model, to predict the evolution of real stands. For example, with a simulated virtual stand (on the left) corresponding to an initial state, we obtained a prediction of the evolution of wood volume up to 40 years (on the right) by the appropriate individual based model.

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