Modelling the Spatial Structure of complex stands by point processes.

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Abstract

There is a growing interest for complex - uneven-aged and /or mixed- stands. The dynamics of these stands are more difficult to understand than those of pure and even-aged stands. Thus, new research questions have arisen in terms of stand description, stand dynamics and modelling.
In terms of growth modelling, the use of individual based models seems more appropriate, because of the individual variability within complex stands. However, it is not easy to use these models, especially because they require knowing the localisation of each tree in order to run simulations.

In this context, Spatial Structure analysis can be used to have a better knowledge of these stands. Indeed, spatial structure, resulting from past biological processes, defines the variety of local neighbourhoods of each tree, which influences future processes. Consequently, spatial structure analysis could be used to characterize these stands; moreover a good characterisation allows realistic modelling approaches.

Our aim is to model the spatial structure of complex stands, in order to be able to simulate realistic virtual complex stands.

Our first step is to characterize precisely complex real stands. We applied an analysis of spatial structure to 25 plots, set up in irregular mixed stands of Oak and Scots pine, of the Orleans forest (France). We used the classical Ripley function L(r) (for univariate and bivariate patterns). We used the spatial results to build a typology of these stands. We

identified five main spatial types.

In a second step, we used appropriate point processes to reconstruct the identified spatial types. We compare the simulated spatial structure to the real one, to investigate how realistic is our simulated stands. We illustrate this step for 2 identified types.

Those simulated stands could be used as initial states for individual based models, when simulating the growth and the dynamic of mixed stands.

Keywords: Complex stand; Spatial structure; Ripley's function; Modelling; Point process; Virtual stand; Oak; Scots pine; Orleans forest.

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