Multiscale geometric representation of heterogeneous stands

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Abstract

The aim of this talk is to present a general geometric model for plant representation that considers different plant perceptions at different levels of organization (or scales).

This model is based on a representation of plant topology that integrates several scales within a single framework. This model, called Multiscale Tree Graph (MTG), can be seen as a set of recursively nested graph, representing different levels of topological organisation. Each entity of a MTG, at any scale, can be augmented with a geometric model. Several geometric representations of the plant can thus be computed, depending on the scale considered to represent geometry. Since these models are geometric representations of the same real object at different scales, they must be consistent with one another. To ensure model definition consistency, within-scale and between-scale constraints are introduced. This constraints enable flexible management of "multiscale geometric models".

Multiscale geometric models can be used to compute geometric representations of plant architecture that are best adapted to some particular criteria. For example, in tree simulation, computer applications are often limited by the tremendous amount of topological and geometric data resulting from the simulation engine. Multiscale geometric models can be used to control the amount of memory used by the representations. It allows us to obtain, for example, compressed plants representations. Different possible applications of this multiscale geometric model to the representation of stands are finally discussed.

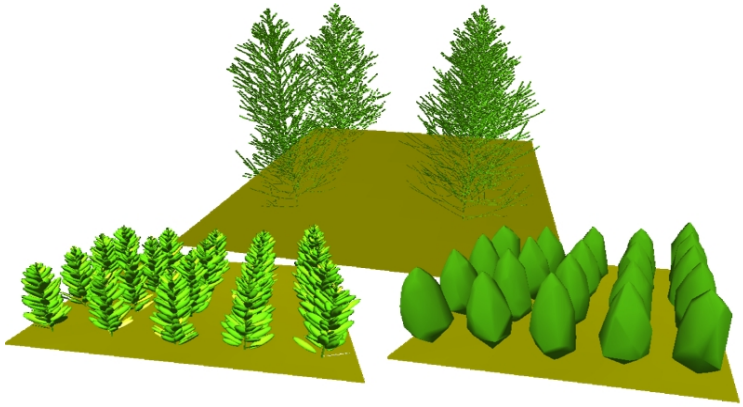

Figure 1: An heterogeneous stand represented at three different scales