Fifth Workshop on Connection between Forest Resources and Wood Quality: Modelling Approaches and Simulation Software, Waiheke Island Resort, New Zealand, 20-27th November 2005.

Real-time Visualization for Heterogeneous Stand

Xiaopeng ZHANG[1,2,*] ***Frédéric BOUDON***[3] ***Barbacci Adelin***[1,3] ***Frédéric BLAISE***[3]

1: Sino-French Laboratory LIAMA, Institute of Automation, CAS, Beijing, China
2: National Laboratory of Pattern Recognition, Institute of Automation, CAS, Beijing, China
3: ISA INRIA Lorraine – LORIA, Nancy, France
E-mail: xpzhang@nlpr.ia.ac.cn, frederic.boudon@loria.fr, adelin_barbacci@yahoo.fr, blaise@loria.fr

Abstract

The perception of landscapes by the public and the prediction of their evolutions according to management plans become an important source of concern in the decision of rural space or forests managers, farmers and local administrations. The use of Geographic Information System (GIS) makes the geo-referenced data exploitation easier and allows production of bi-dimensional maps. Techniques for tri-dimensional visualization are less developed and are usually deficient for interactivity.

Because of the very low forest growth, it is however necessary to use virtual realistic mock-ups of stands with interactive visualization tools to explore and discuss different exploitation scenarios producing effects on several decades. The realism of the forest models is of main importance to reproduce accurate visual environment. However, the resulting data complexity will be hardly handled by modern computer without simplification schemes and several visual artifacts such as aliasing will appear.

This project aims at providing some robust interactive tools for virtual forest visualization. We consider very general 3D stand descriptions based on polygonal representations, such as AMAP descriptions, without limit in the variety or types of trees. Various simplification schemes are used to display tree models according to the view point with adaptative level of details.

Our techniques are based on the geometric analysis of plant architectural shape and define adaptative representations of this geometry. Several computer graphics methods, such as texture mapping and anti-aliasing algorithm, are used to enhance reality experience in display. The specific methods we use include: (1) use of a multi-scale topological structure to define progressive simplification of complex foliage and flowers; (2) multi-resolutional construction of plant branching geometry; (3) level of details and speed of display can be balanced and controlled by user; (4) plant models with high and low simplification rates can be displayed in the same forestry scene according to their visual importance. During simplification, original visual appearances of tree models are maintained within permission scope.

The usefulness of this interface tool for human-computer interaction for virtual forestry growth experiment will be shown with various software demonstrations.

Keywords: Stand, Visualization, Plant Architecture.

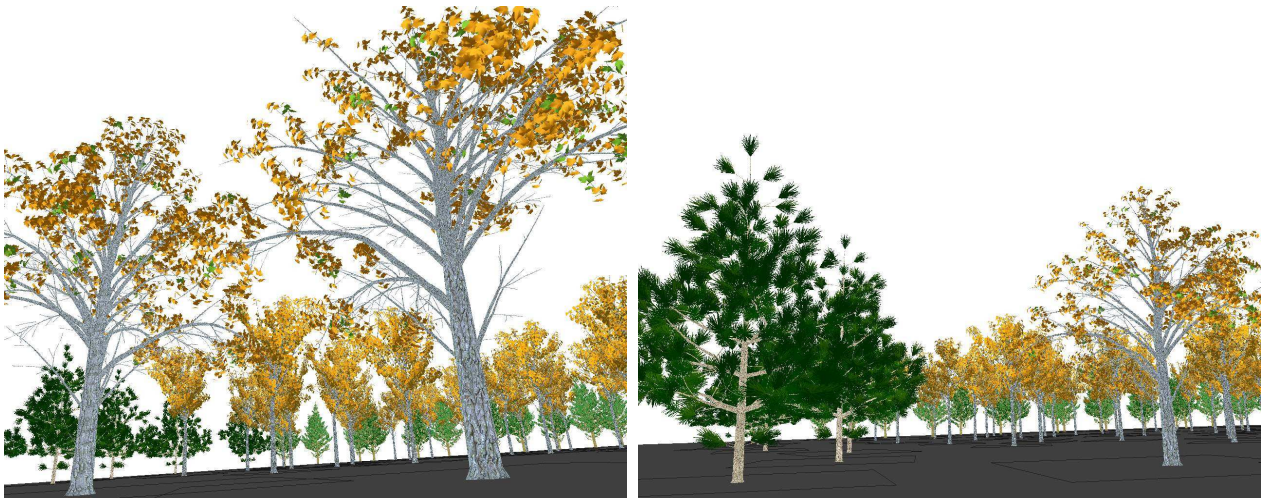

Figure 1. Visualization with rich details and fast display of heterogeneous stands.

[*] The work of Xiaopeng ZHANG is supported by National Natural Science Foundation of China under Grant No. 60473110, 30270403, the National High Technology Development 863 Program of China under Grant No. 2002AA241221.