ALEA: A software for integrating analysis and simulation tools for 3D architecture and ecophysiology

Christophe Pradal, Nicolas Donès, Christophe Godin, Pierre Reuille, Frédéric Boudon, A. Adam, Hervé Sinoquet

HAL Id: hal-00830075
https://hal.inria.fr/hal-00830075

Submitted on 4 Jun 2013

ALEA: A software for integrating analysis and simulation tools for 3D architecture and ecophysiology

Christophe Pradal[1], Nicolas Dones[2], Christophe Godin[1], Pierre Barbier de Reuille[1], Frédéric Boudon[1], Boris Adam[2], Hervé Sinoquet[2]

[1]UMR AMAP, Montpellier France, [2]UMR PIAF, Clermont Ferrand, France

In several circumstances, and in particular at the first workshop on functional-structural models held in Helsinki, December 1996, the fact that the plant structure-function modelling community should have a coordinated effort in the development of data standards, tools and software was underlined. The **ALEA** project, initially sponsored by the Réseau d'Ecophysiologie de l'Arbre from INRA, aims at providing modellers and biologists with a homogeneous software platform, integrating various tools and models for studying plant architecture and its development. This platform is intended to have the following features:

- It should allow the integration of tools and models that currently exist in different laboratories within a unique software framework. These modules, possibly written in different languages (C, C++, Fortran, …) should be integrated in ALEA without rewriting them.
- It should provide a set of general-purpose tools (3D plant representation, data structure standards, …) that can be reused by every modeller.
- It should provide a common high-level language interface to all tools and models.
- It should provide an open-software kernel, developed by a community of people from interested institutes;
- It should define a user-friendly graphic interface to the different modules.
- It should be available on Linux and Windows operating systems.
- It should be able to communicate with other main softwares about plant architecture (like L-Studio, Grogra, Lignum, …)

The first kernel of ALEA was developed in 2003. It is based on the Python language (http://www.python.org) that aims at being both a "glue" language for the different modules and an efficient modelling language for developing new models and tools. ALEA currently includes the following modules:

- **AMAPmod,** analysis of plant architecture developed by C. Godin, Y. Guédon et al. at UMR AMAP, Montpellier, France
- **RATP,** radiative transfer, transpiration and photosynthesis developed by H. Sinoquet at UMR PIAF, Clermont-Ferrand, France
- **Archimed,** contains several models of ecophysiology, developed by J. Dauzat at UMR AMAP, integrated in ALEA by C. Pradeille, Montpellier, France
- **Canestra**, radiative transfer, developed by M. Chelle and integrated in ALEA by H. Autret, at INRA Paris-Grignon,
- **PlantGL** (Plant Geometric Library), a 3D geometric library dedicated to plant architecture representation, developed by F. Boudon, C. Pradal, et al. at UMR AMAP, Montpellier, France
- **A user-friendly graphic interface**, centered on 3D vegetal scene interaction, developed by Nicolas Dones, Boris Adam, Christophe Pradal et al. at UMR PIAF, Clermont-Ferrand, France.

Integration of other modules and development of connections with other software are planned in 2004.