OpenAlea: An open-source platform for the integration of heterogeneous FSPM components

S. Dufour-Kowalski[1], C. Pradal[2], N. Dones[3], P. Barbier de Reuille[1], F. Boudon[2], J. Chopard[1], D. DaSilva[4], J.-B. Durand[7], P. Ferraro[6], C. Fournier[5], Y. Guédon[2], A. Ouangraoua[6], C. Smith[8], S. Stoma[1], F. Théveny[2], H. Sinoquet[3] and C. Godin[1]

[1] INRIA, 2004 route des lucioles BP 93, 06902 Sophia Antipolis, France
[2] CIRAD, Avenue Agropolis, 34398 Montpellier cedex 5, France
[3] INRA, Site de Crouël, 234 avenue du Brézet, 63100 Clermont-Ferrand, France
[4] Université Montpellier 2, place Eugène Bataillon,34095 Montpellier, France
[5] INRA, Centre de Grignon, BP 01, 78850 Thiverval Grignon, France
[6] Université Bordeaux 1, LaBRI, 351 cours de la Libération, F-33405 Talence Cedex, France
[7] INPG, LJK/IMAG, BP 53, 38041 Grenoble cedex 9, France
[8] INRA, 2 place Viala, 34060 Montpellier cedex 1, France

Keywords: open source, component framework, plant modeling

Introduction

The open source OpenAlea project's goal is to share and reuse heterogeneous models from the FSPM community. In this poster, we present our development strategy to create an open source research platform as well as some of the main components of OpenAlea.

A collaborative approach for sharing a software framework

The open source development model provides a framework to efficiently develop a software platform in a scientific context. It improves: (a) scientific validation by providing access to the source code for the entire community; (b) scientific collaboration by providing free access to published scientific models; (c) synergy by enhancing the collaboration between multidisciplinary research teams; (d) economies of scale by sharing development, distribution and maintenance cost; and (e) software quality by enforcing common rules and best practices. The OpenAlea platform is based on this principle. Documentation, source code, forum, bug tracking and binary distributions are freely available in a collaborative web space (http://openalea.gforge.inria.fr). Developers and modelers start collaboration and work together in pairs on a common objective during coding and modeling sprint sessions, encouraging communication, feedback and exchanges. The OpenAlea platform is distributed under a free license (GNU LGPL) allowing external components to choose their own license (including proprietary). Each modeler is responsible for the development of its modules but takes advantage of the facilities provided by the framework.

Available OpenAlea functionalities

Heterogeneous components are integrated in OpenAlea: (a) simulation models of ecophysiological processes (e.g. RATP, PyCaribu, PyDrop, etc.); (b) topological and geometrical analysis of plant architecture (e.g. V-Plants, formerly AMAPmod); (c) geometric representation, and visualization of plants at different scales (e.g. PlantGL); (d) common data structures (e.g. sequence, tree, graph, MTG, grid, etc.); and (e) simulation models and reconstruction of meristem (e.g. Merrysim, TissueMeca, etc.). Using OpenAlea and standard Python scientific libraries, users can combine components into customized data flows according to their specific needs. A demonstration of the OpenAlea platform and the requirements to integrate a module will be carried out at the conference.

Reference

Pradal C., Dufour-Kowalski S., Boudon F. and Dones N. 2007. The architecture of OpenAlea: A visual programming and component-based software for plant modeling. FSPM07.

Pradal C., Boudon F., Donès N., Durand J.-B., Fournier C., Sinoquet H., Godin C. 2006. OpenAlea - A platform for plant modelling, analysis and simulation, in: EuroPython 2006.

Pradal C., Boudon F., Nouguier C., Chopard J., and Godin C. PlantGL : a Python-based software for 3D plant modelling at different scales. To be submitted.

Godin C., Guédon Y. and Costes E. 1999. Exploration of plant architecture databases with the AMAPmod software illustrated on an apple-tree hybrid family. Agronomie 19.

Sinoquet H., Le Roux X., Adam B., Ameglio T. and Daudet F.A. 2001. RATP : a model for simulating the spatial distribution of radiation absorption, transpiration and photosynthesis within canopies : application to an isolated tree crown. Plant cell environ 24.

Bussière F., Dufour-Kowalski S. and Bassette C. 2007. A software for the simulation of rainfall distribution on 3D plant architecture: PyDROP. FSPM07.