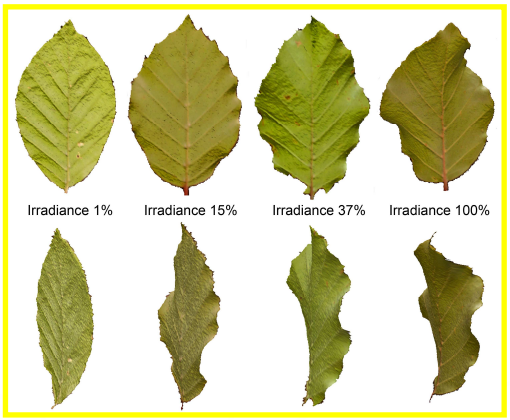
Plantes virtuelles: Méthodes et outils

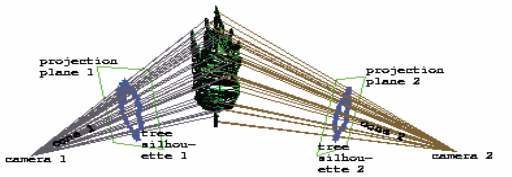
C. FOURNIER

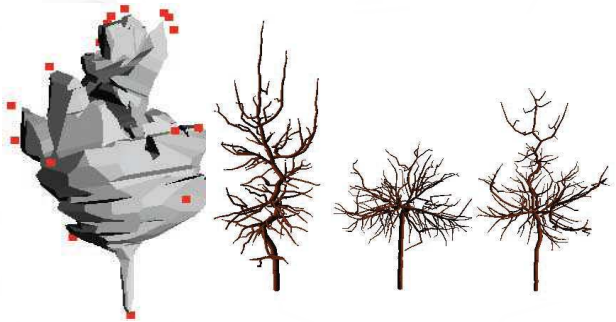
Des outils pour quoi ?

- Acquisition et reconstruction
- Modélisation et Formalisation
- Simulation dynamique
- Couplage

Acquisition directe automatique laser scanner 3D/ photos

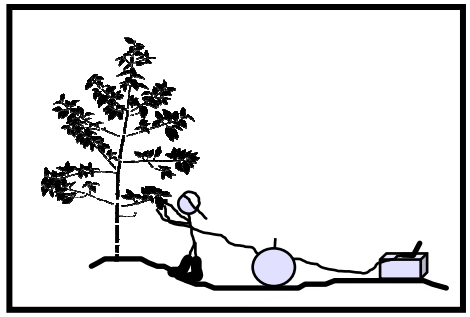


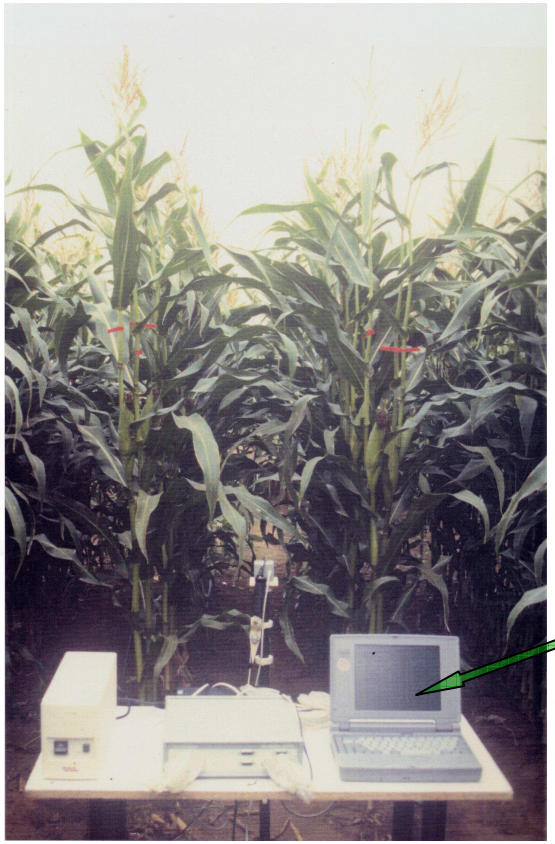




[Tan,07]

Acquisition directe manuelle : digitalisation

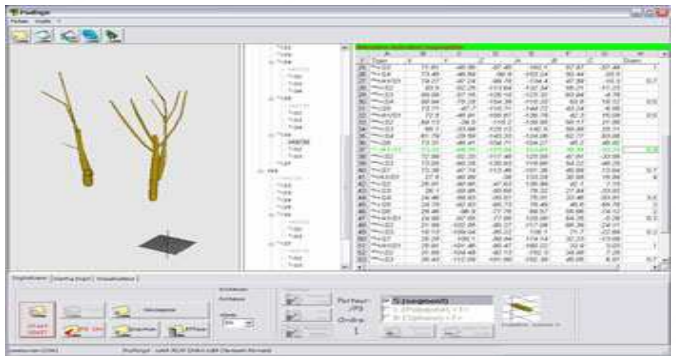




transmitter

receiver

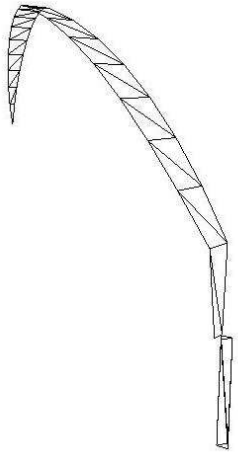
software

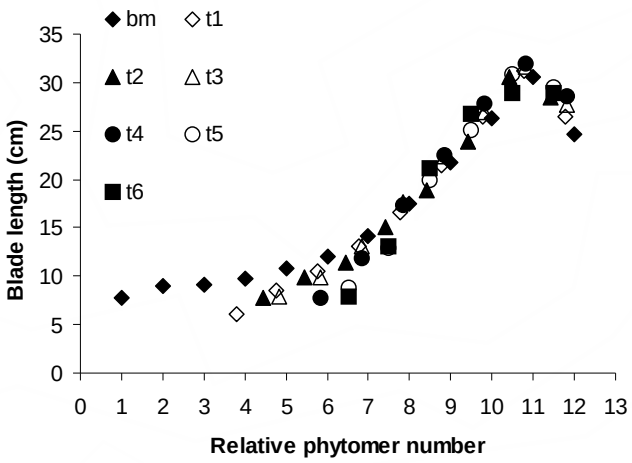


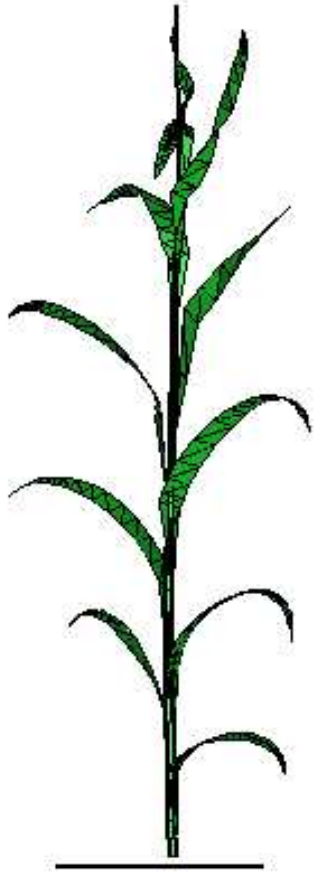
Piafdigit

Digitalisation a partir de photos

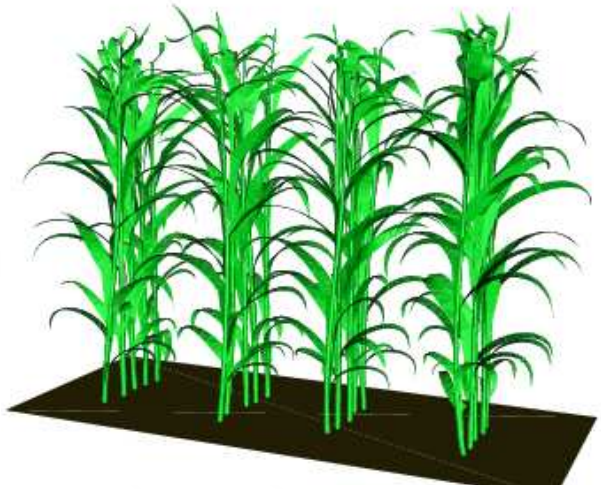
Mesures complémentaires /reconstruction





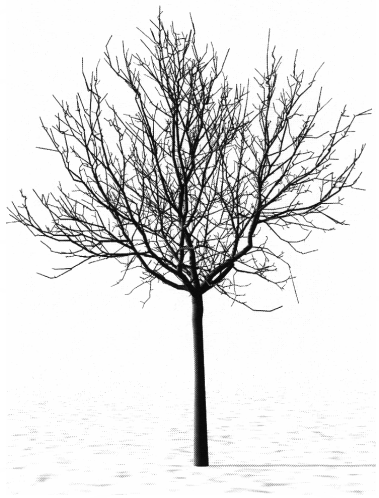


Plantes réelles vs. Plantes digitalisées



Sorghum
(Drouet, 1998)
Maize

Wheat
(Saint-Jean and Ljutovac, 1999)

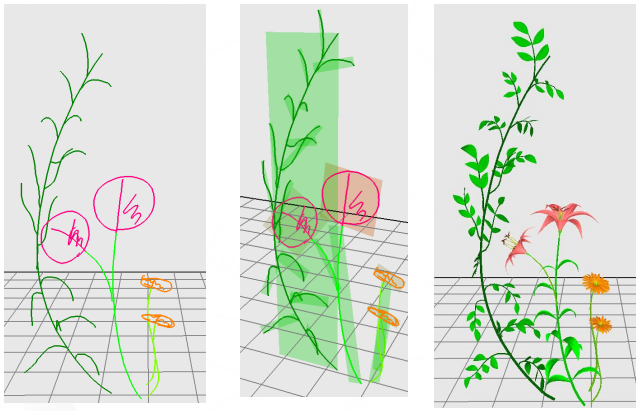


‘Grand’ noyer (8 m)

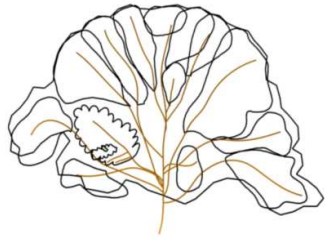
Manguier

INRA, Piaf

Sketching : dessin assisté par ordinateur



[Ijiri,06]

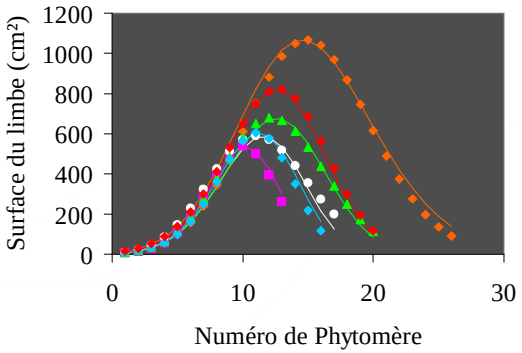


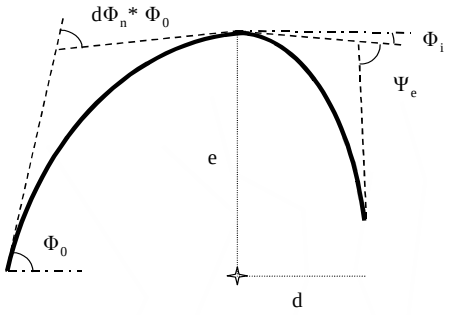
Boudon 08

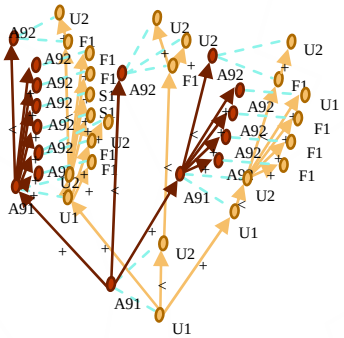
Modélisation : outils d'analyse

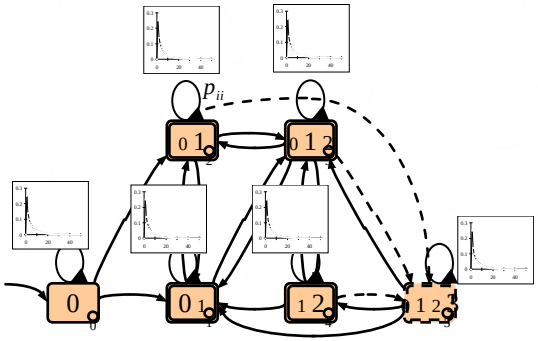
Outils classiques (R, Excell, mathlab)

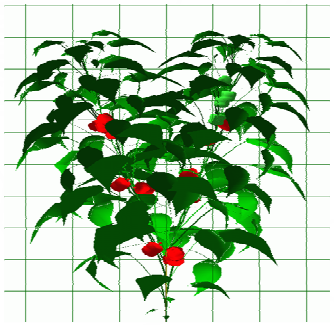
VPlants(A MAPmod)

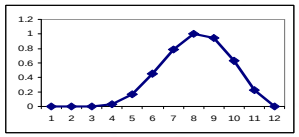




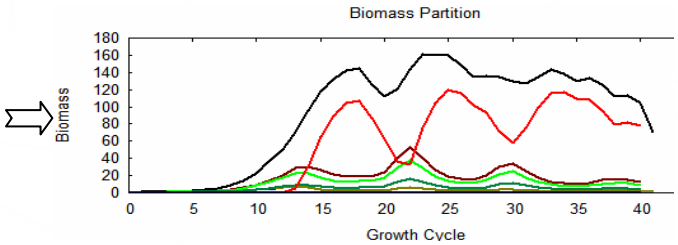




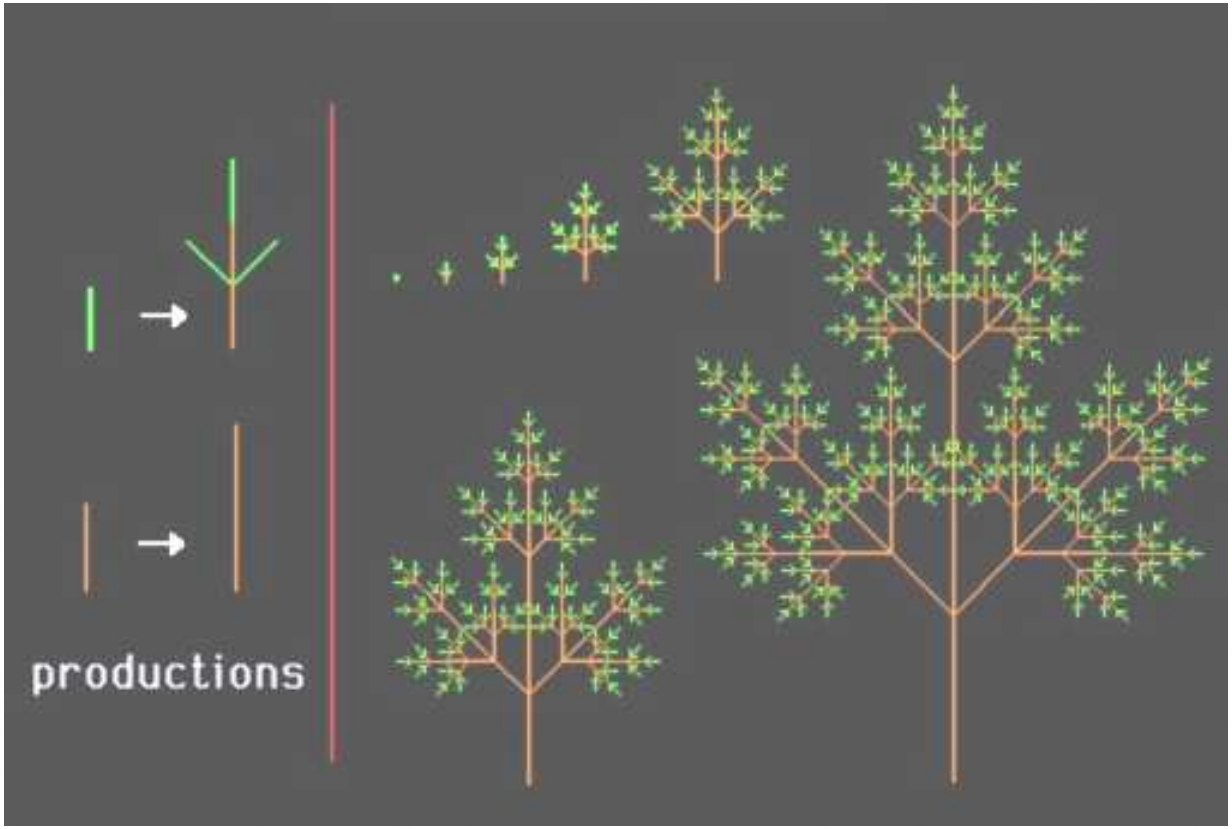




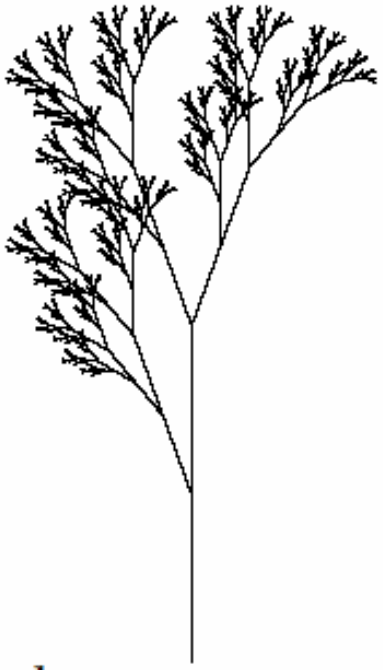
Computed organ sink variations



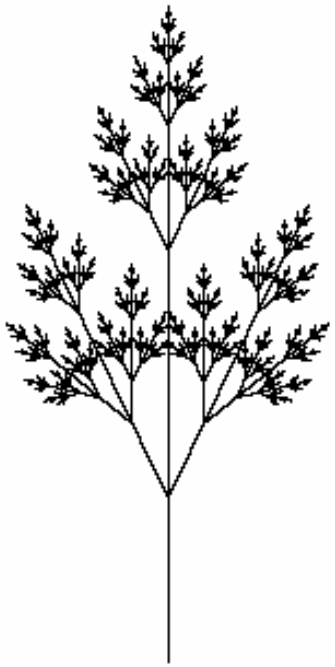
Approche L-Système



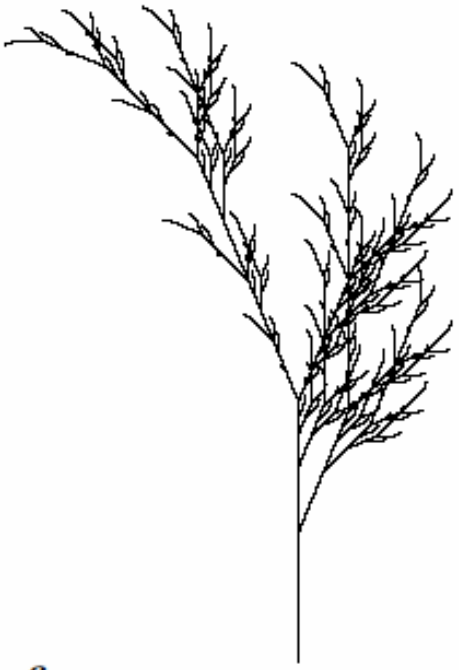
Application



d
n=7, δ=20°
X
X → F[+X]F[-X]+X
F → FF

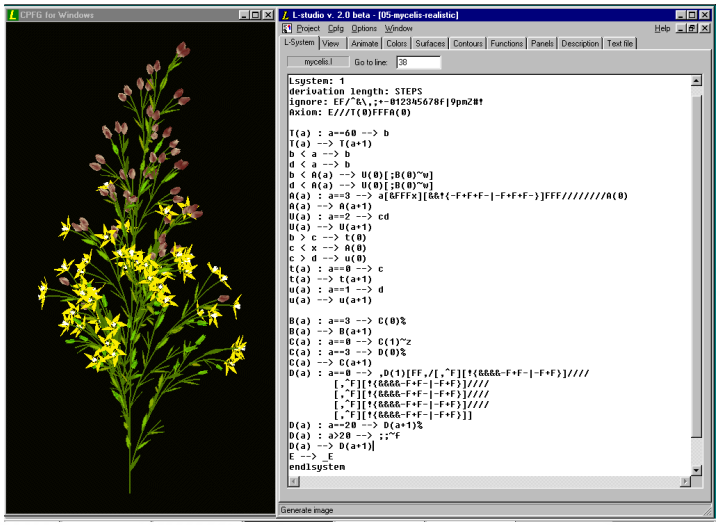


e
n=7, δ=25.7°
X
X → F[+X][-X]FX
F → FF

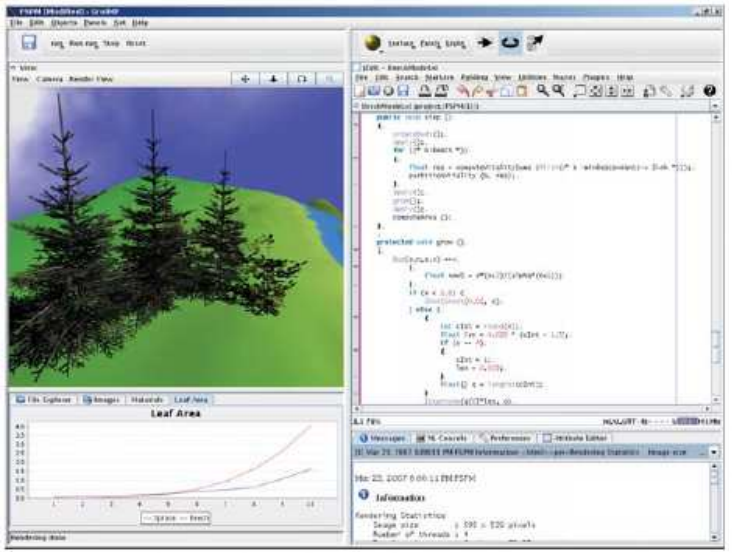


f
n=5, δ=22.5°
X
X → F-[[X]+X]+F[+FX]-X
F → FF

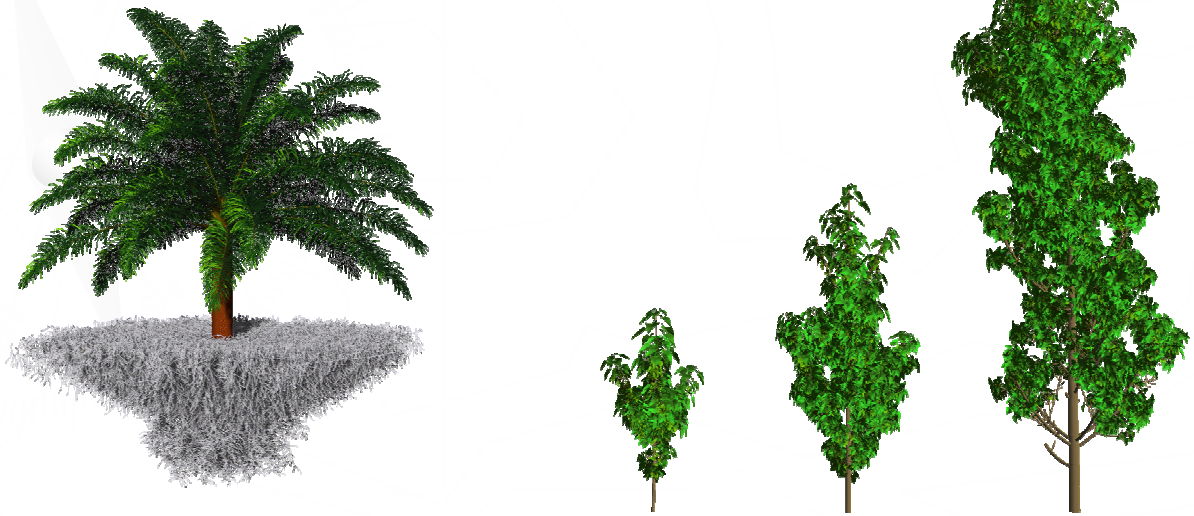
Simulation



Prusinkiewicz et. al., LStudio



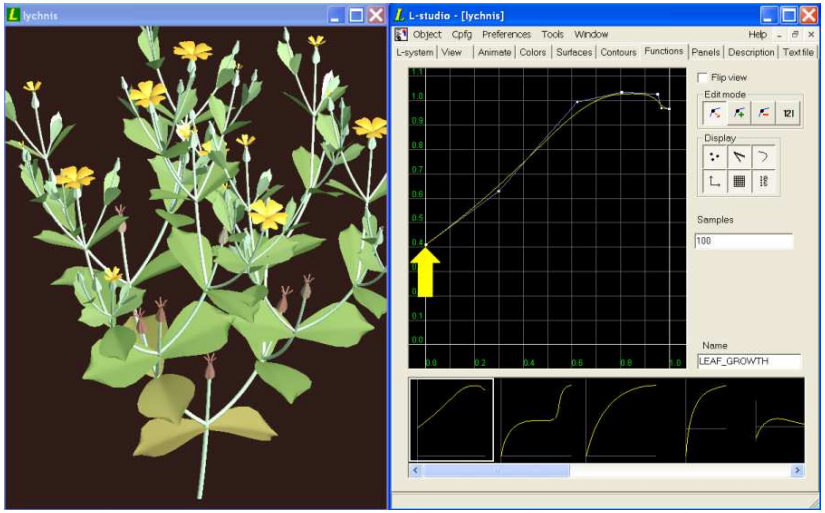
Kniemeyer et. al., GroIMP

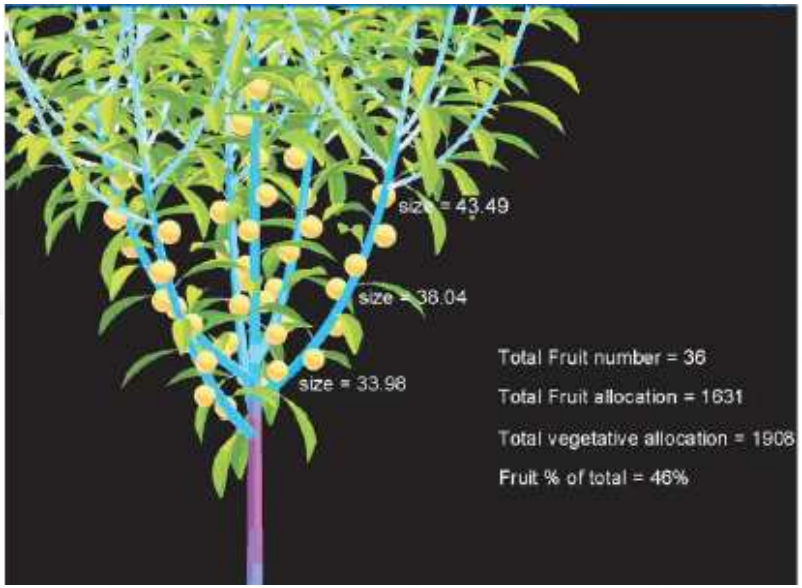


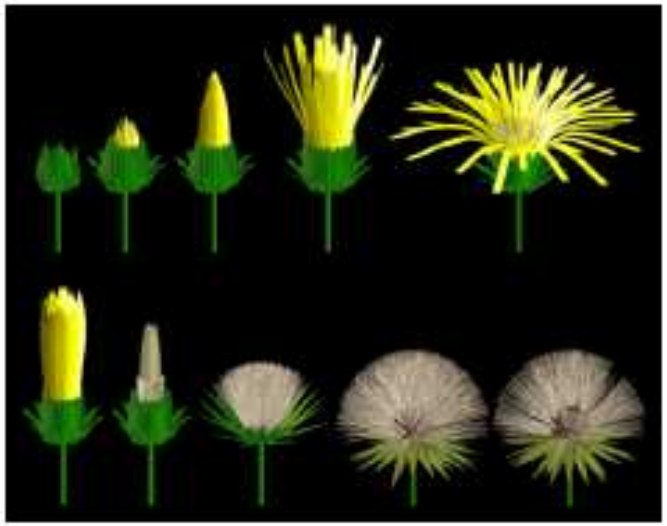
Barczi, AMAPSim

Principales fonctionalités

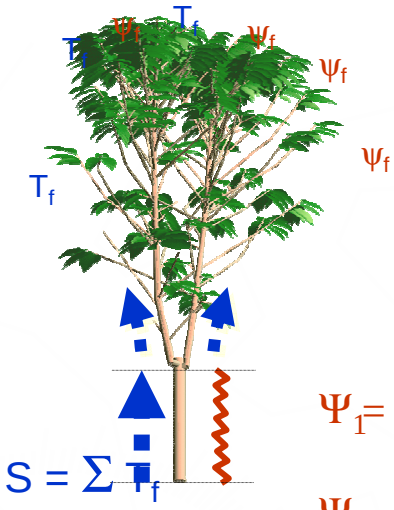
- Langage proche du modèle
- Simplicité d'installation
- Richesse et ergonomie des outils de représentation 3D
- Prise en charge de la boucle de simulation
- Bibliothèque d'exemples pédagogiques
- interactivité





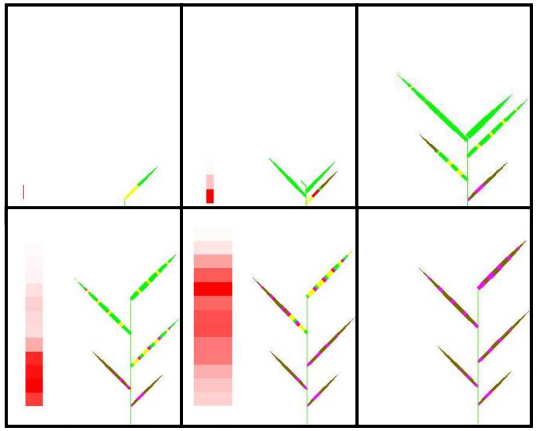


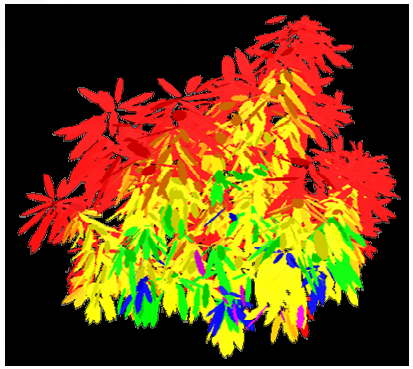
Simulation : au-delà de la dynamique de développement

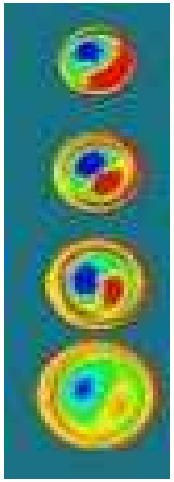


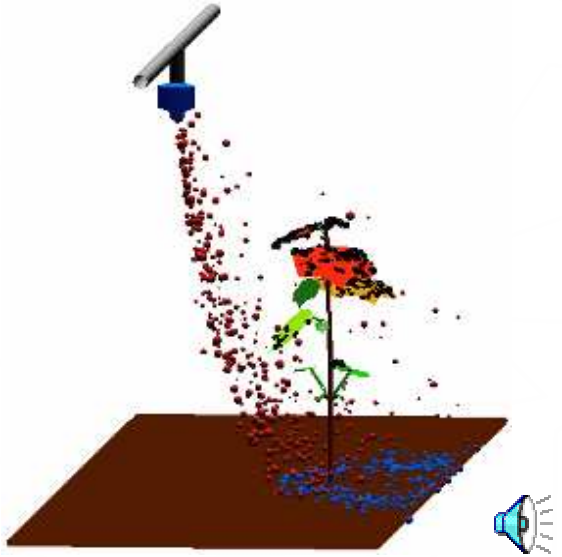
$\Psi_1 = \Psi_0 - R.S$

Ψ_0

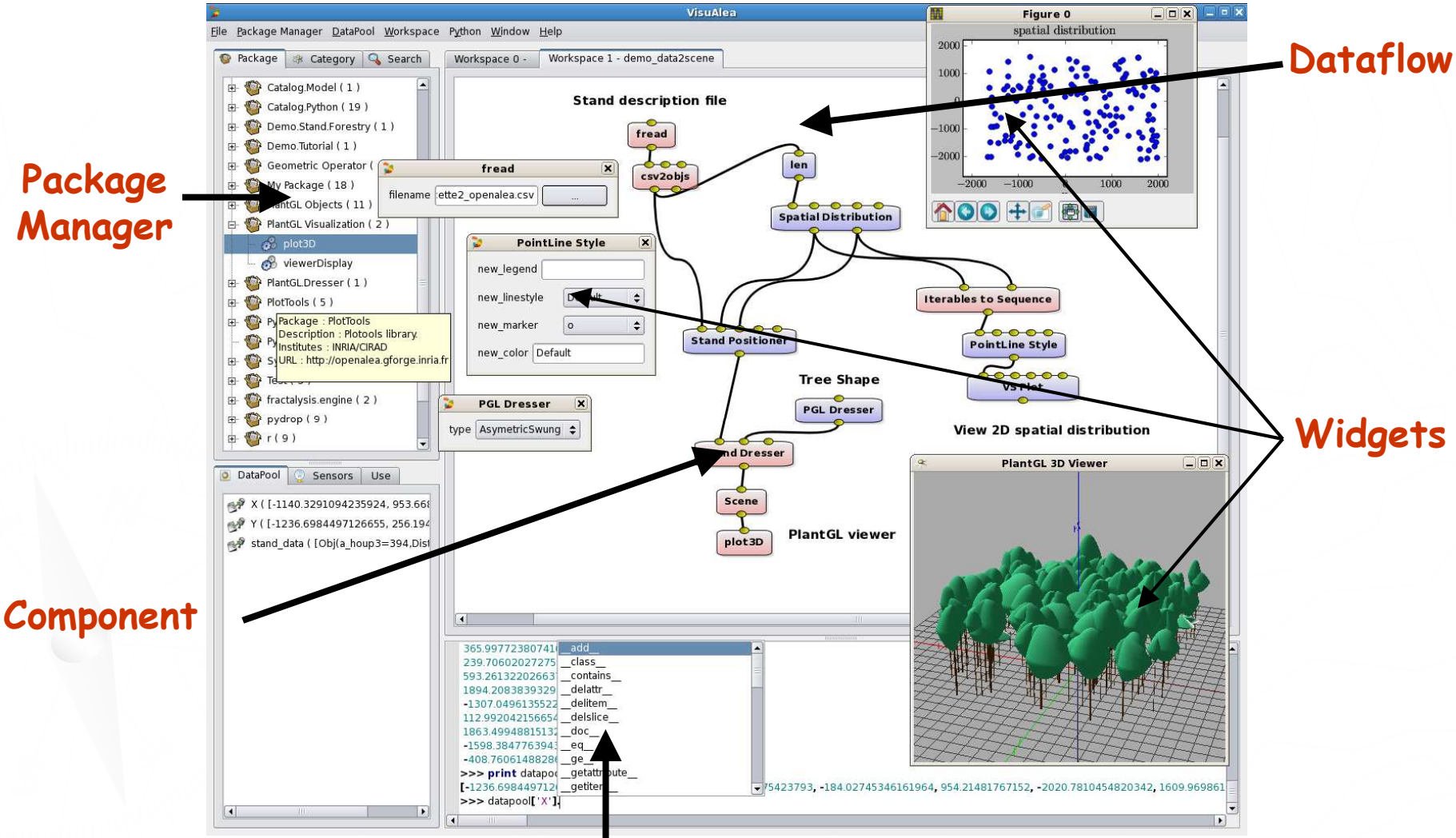








Plateforme : coupler les modèles



OpenAlea

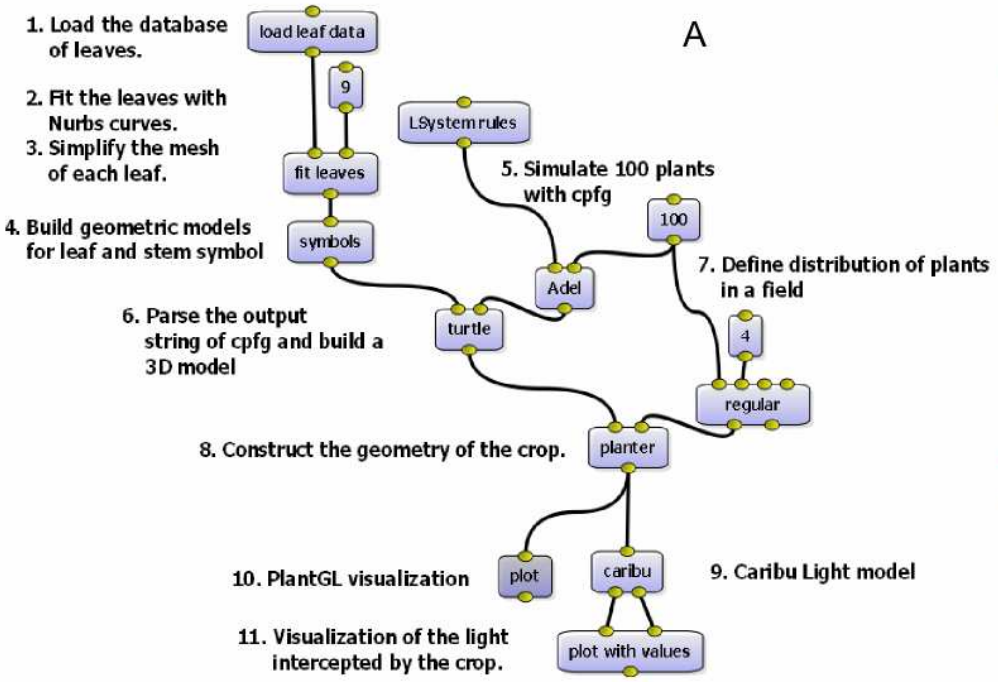
Exemple

Graphical model

- Visual representation of a model
- Connect components in a directed graph
- Data flow through edges

Model of computation

- Functional (deterministic)
- Lazy evaluation



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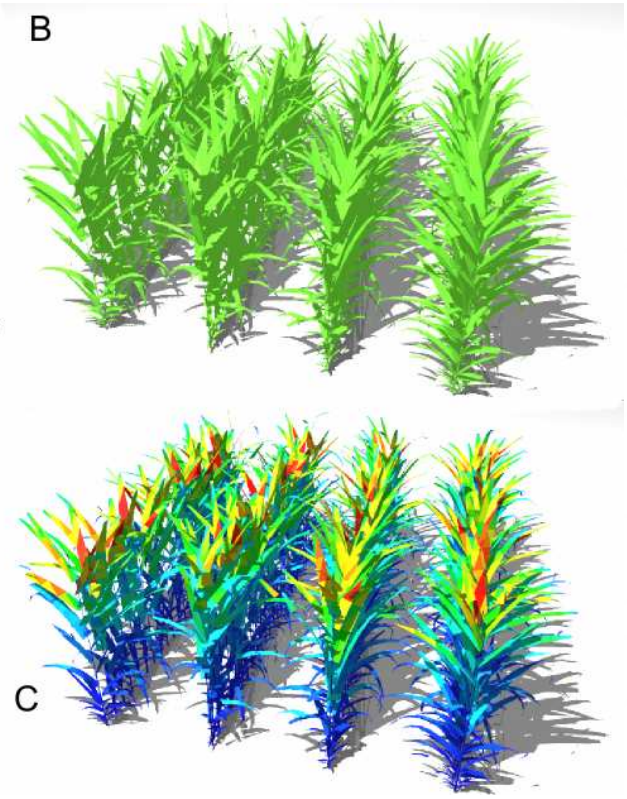

Bilan

- Offre riche 'en pyramide' sur les différents thèmes
  - Acquisition > Simulation >Modélisation >plateformes
  - Communauté française active (AMAP, VPlants, PIAF, Digiplant,…)
- Outils centrés sur le développement
  - Enjeux : multi-processus et multi-échelle
  - Méthodologie de couplages multiples (cohérence, précision…)