Séminaire de Biologie des Plantes

Les séminaires ont lieu sur le Campus Montpellier SupAgro/INRA de La Gaillarde (2, place P. Viala Montpellier)

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Jeudi 3 juillet 2008
Amphi 208 (Cœur d'Ecole) à 14h00

Nathalie Wuyts
(Scottish Crop Research Institute, Dundee, Scotland ; UMR Laboratoire d'Ecophysiologie des Plantes sous Stress Environnementaux)

New tools for motion analysis of time-lapse confocal laser scanning microscopy images: exploring the dynamics of Arabidopsis root growth

Existing methods using microscopy and digital imaging to investigate root morphogenesis and growth are typically limited in spatial and temporal resolution, providing little detailed information on the dynamics of tissue and cell expansion. Using methods from computer vision and statistical modelling, a new software tool - PlantVis – was developed for automated motion analysis of image sequences generated by time-lapse confocal laser scanning microscopy (CLSM). CLSM allows for optical sectioning and therefore imaging of living root tissue and cells in three dimensions. PlantVis estimates the displacements over time of local regions of pixels across the image sequence. It also provides an indication of the certainty of each such estimate. High certainty is indicated wherever local image structure and dynamics carry sufficient information to disambiguate the visual motion (given the modelling assumptions made by PlantVis). The resulting data enable detailed visualisation of the displacement of root tissue layers and even cells and cell walls, depending on the magnification. The data can be easily imported into statistical software like R for further analysis such as calculation of velocity profiles along the root axis. The tool is being applied in the analysis of changes in root growth dynamics and cell expansion in the elongation zone of *Arabidopsis thaliana* roots under the influence of abiotic stresses, including mechanical impedance, but potential applications are numerous and diverse. Motion

analysis is not restricted to primary roots; time-lapse images of lateral root primordia, lateral roots and root hairs can be analysed provided that motion occurs in the focal plane of the lens. The three dimensional nature of root growth, due to circumnutation or gravitropic responses, is a strong motivation for the development of 3-D tracking procedures. Progress towards estimating motion of roots in 3-D is discussed.

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