Extension of the GroIMP modelling platform to allow easy specification of differential equations describing biological processes within plant models

In simulation models of plant development, physiological processes taking place in plants are typically described in terms of ODEs (Ordinary Differential Equations). On the one hand, those processes drive the development of the plant structure and on the other hand, the developed structure again influences these processes (e.g., photosynthesis, hormone synthesis and transport, and allocation of carbon, nitrogen, etc.). To study this dependence, simulation models, termed functional-structural plant models (FSPMs), are developed. Such models usually operate at the organ scale, considering the topology and the geometry of organs, while being validated at the scale of the plant individual. The open source modelling platform GroIMP was designed for the purpose of creating FSPMs. In GroIMP, the structure of a plant is described by the eXtended L-system language (XL) which is an extension of the Java programming language and works on a general graph structure. It is general enough to be used for many biological problems that can be described by graphs. Until now, to specify and solve ODEs, Java code had to be used and there was no general solution for doing this easily and conveniently in XL. Here we propose an extension to the XL language that allows the user to easily specify ODEs in terms of rule applications. Furthermore, their specification is separated from the numerical solution, with the possibility to choose between different integration methods.
**Liens**


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