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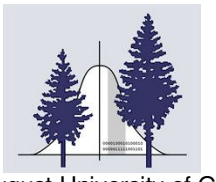

Georg-August University of Göttingen
Chair for Computer Graphics and Ecological Informatics
Büsgenweg 4, 37077 Göttingen, Germany
http://www.uni-goettingen.de/en/67072.html

Third announcement:
International Summer School
"Modelling and Simulation with GroIMP"

(combined with the fourth GroIMP user and developer meeting
and including a workshop "Rule-based 3-d models of plants and other objects")

partially funded by the German Academic Exchange Service
in the programme "DAAD Ostpartnerschaften"

Date: 27 September - 1st October 2010

XL and GroIMP tutorial for beginners:	27 Sept., 9:00 h – 28 Sept., 18:15 h
Workshop:	29 Sept., 9:00 h – 18:15 h
Tutorial for advanced XL and GroIMP users:	30 Sept., 9:00 h – 1st Oct., 12:00 h
GroIMP user and developer meeting:	30 Sept., 13:30 h – 14:00 h

Location: University of Göttingen, Department Ecoinformatics, Biometrics and Forest Growth, Büsgenweg 4, 37077 Göttingen, Germany
Room CIP I

Accommodation in Göttingen can be found under
http://www.goettingen-tourismus.de/staticsite/staticsite.php?menuid=174&topmenu=174&keepmenu=inactive.

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Time schedule

(red: contributions not yet listed in the second announcement)

Monday, 27 Sept. 2010

9:00 Opening, Introduction,
preparatory meeting for students who need certified ECTS credits
9:15 W. Kurth: Introduction to rule-based programming, L-systems and XL
10:15 *Coffee break*
10:30 W. Kurth: Some basic examples in XL (part 1)
11:15 Simple branched structures modelled with XL (team work)
12:00 *Lunch*

13:30 W. Kurth: Basic examples in XL (part 2)
14:30 R. Hemmerling and K. Smoleňová: How to model a daisy in 1/2 hour
15:00 Simple rendered plants modelled with XL (team work)
15:45 *Coffee break*
16:15 W. Kurth: Some basic examples in XL (part 3)
17:00 *Coffee break* and/or Questions and answers
17:30 M. Henke: A closer look at some examples from the grogra.de gallery
- ca. 18:30

Tuesday, 28 Sept.

9:00 G. Buck-Sorlin: How to implement a simple FSPM
10:00 W. Kurth: Basic examples in XL (part 4)
10:45 *Coffee break*
11:15 W. Kurth: Interpretive rules and instantiation rules
11:45 Using instantiation rules (team work)
12:15 *Lunch*

13:45 W. Kurth: Modelling point patterns, competition and plant-herbivore interaction
14:30 Experiments with point patterns or spreading animals (team work)
15:15 *Coffee break*
15:45 K. Smoleňová: Modelling morphological features of trees in XL
16:45 R. Hemmerling: Working with graphs containing cycles
17:30 Questions and answers, evaluation session of beginners' tutorial
- ca. 18:00

Wednesday, 29 Sept. 2010

Workshop "Rule-based 3-d models of plants and other objects":

9:00 J. Evers: Simulating hormonal regulation of bud break modulated by light quality

9:45 P. Favre: A model of resource allocation in plant growth

10:30 *Coffee break*

11:00 K. Smoleňová and G. Buck-Sorlin: An FSPM of barley including the allocation and effects of carbon, nitrogen and gibberellic acid

12:00 *Lunch*

13:30 R. van Daelen: A tomato model

14:15 P. de Visser and G. Buck-Sorlin: Testing the effect of different light node types and shaders on the simulation of light absorption and photosynthesis of a tomato crop in a greenhouse setting

15:00 M. Henke: A first step towards a generic FSPM

15:45 *Coffee break*

16:15 J. Dérer: On animating artificial life forms

or P. Masters and K.-P. Zauner: Robotropism: Distributed Control of Plants

17:00 G. Buck-Sorlin: SIMPLER: An FSPM coupling shoot production and human interaction with the structure, morphogenesis, photosynthesis and light environment in cut-rose

17:45 All: Conclusions and future projects
- 18:15

19:00 *Summer School Dinner*

Thursday, 30 Sept.

9:00 R. Hemmerling: A model of a mixed stand, including competition for light
10:00 W. Kurth: Modelling above- and below-ground competition together
10:45 *Coffee break*
11:15 O. Kniemeyer: The XL plugin for the 3-d modeller Cinema 4D
12:00 *Lunch*

13:30 GroIMP User and developer meeting
14:00 P. Surovy: Introduction to electromagnetic 3-d digitization
15:15 *Coffee break*
15:45 R. Hemmerling: How to control parameter values using GroIMP's GUI
16:15 Questions and answers session (plenary)
17:00 Questions and answers team sessions

- ca. 18:00
Friday, 1st October

9:15 G. Buck-Sorlin: Large functional-structural crop models in XL. Design – maintenance – pitfalls
10:15 Coffee break
10:45 R. Hemmerling: Tracking the solution of an ODE using monitor functions
11:45 Evaluation session of advanced tutorial
- 12:00

End of summer school: 1st October, 12:00 h

Abstracts of workshop contributions

Gerhard Buck-Sorlin (Wageningen UR):

SIMPLER: An FSPM coupling shoot production and human interaction with the structure, morphogenesis, photosynthesis and light environment in cut-rose

The production of cut-rose involves a specific combination of plant material, management practice and environment. Cut-roses are grown in highly controlled greenhouses. Amount of light intercepted and subsequent assimilate production depend on numerous factors (canopy structure, plant arrangement, greenhouse construction, or season). The Functional-Structural model of cut-rose (implemented in GroIMP/XL) presented here attempts to tackle the complexity of the combination of these factors in one modelling system. This model will be the departure point for both an extensible research platform for rose physiology and a decision-support tool for growers, breeders and consultants.

Pieter de Visser and Gerhard Buck-Sorlin (Wageningen UR):

Testing the effect of different light node types and shaders on the simulation of light absorption and photosynthesis of a tomato crop in a greenhouse setting.

A 3D model of a greenhouse construction is built in GroIMP, including lamps, plants and substrate slabs. The challenge is to correctly simulate the light distribution and light absorption in the crop canopy. The effect of using different light nodes types for the diffuse sky, direct sunlight and lamps on the fate of light is evaluated. Apart of variations in the radiation intensities, the differences between absorbed and sensed radiation and between different types of shaders are presented. Finally, the prospects to use GroIMP for testing illumination strategies in horticulture are discussed.

Jan-Anton Dérer (MediaDesign University, Berlin):
On animating artificial life forms

Jochem Evers (Wageningen UR):

Simulating hormonal regulation of bud break modulated by light quality

Bud break in plants is regulated by endogenous hormonal signals and environmental factors such as light. In this study, the objective was to get insight into hormonal regulation of bud break as modulated by the red/far-red ratio of the incoming light. To this end, conceptual modelling of hormone signalling related to bud break was combined with computational modelling of light signalling within a growing plant structure. Model species was Arabidopsis, and model implementation was done in XL using the GroIMP platform.

Patrick Favre (University of Fribourg):

A model of resource allocation in plant growth

Our study is to understand the adaptiveness of allocations resources for rosette plant growth. A mathematical model containing the shoot and the root compartments, was developed to integrate the physical and physiological properties for the production of sugar by the leaves, the uptake of phosphate by the roots and the transport of these substances to each compartment. Our equations were then incorporated in a Lindenmayer-systems model with multiple-compartments using the Java-based GroIMP software. The 3D structure allows to calculate light interception, to take into account the root ramification and to make contact with arbuscular mycorrhizae in the case of Petunia hybrida plants in symbiotic associations. This model will also be used to study growth of Arabidopsis thaliana mutants.

Michael Henke (University of Göttingen):
A first step towards a generic FSPM

Paul Masters and Klaus-Peter Zauner (University of Southampton, UK):

Robotropism: Distributed Control of Plants

We envisage electronic controllers attached to plants to cause them to grow in desired directions. Rather like robots with plants as their bodies, the controllers may communicate and cooperate to encourage plants to grow along dynamically adjusted trajectories into pre-defined complex structures. Light, gravity and touch sensitivity are included into a model of a climbing plant. A physics engine is introduced to GroIMP as a way of modelling gravitational effects on the plants. The possibilities for growing simple structures are explored.

Katarína Smoleňová and Gerhard Buck-Sorlin (University of Göttingen / Wageningen UR):
An FSPM of barley including the allocation and effects of carbon, nitrogen and gibberellic acid

Raymond van Daelen (Keygene NV, Dept. Bio-Informatics, Wageningen):

A tomato model

The architecture of tomato is a crucial aspect for the production of tomatoes, for instance time and placing of inflorescences, structure of trusses, number of leaves between trusses, formation of side shoots, etc. Keygene is interested in analyzing mechanisms involved in determining these aspects. Even though many genes are known, such as SFT, SP, AN, BL, FA, S, J, F, which somehow affect flowering and/or truss shapes, the interactions between these genes, if any, is poorly known. We are developing a functional-structural plant model to analyze and possibly elucidate the potential interactions between these genes, to explain the mechanisms that determine the meristem fate with respect to vegetative growth and switch to flowering. We will present the current state of the developed model, which was created using GroIMP.