



Interactive modeling, visualization and simulation of biological motivated trees

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Light in a tree

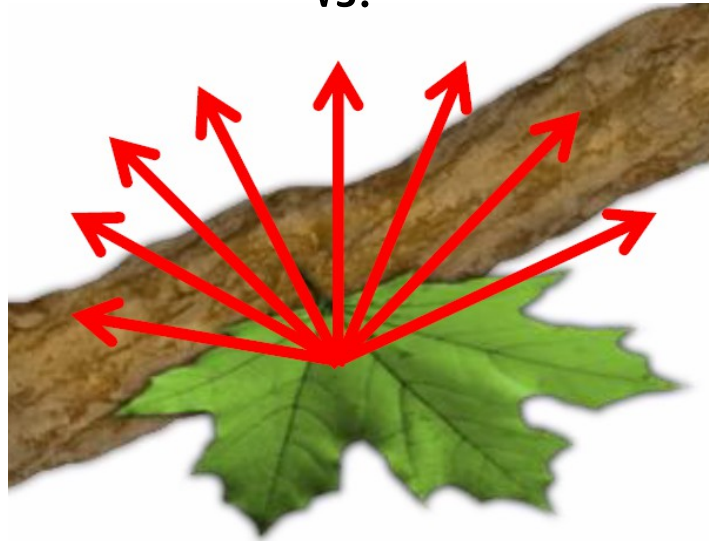
Leafcluster vs. RayTracing

- p_{Neutrieb} , p_{Tod} , Wuchsrichtung



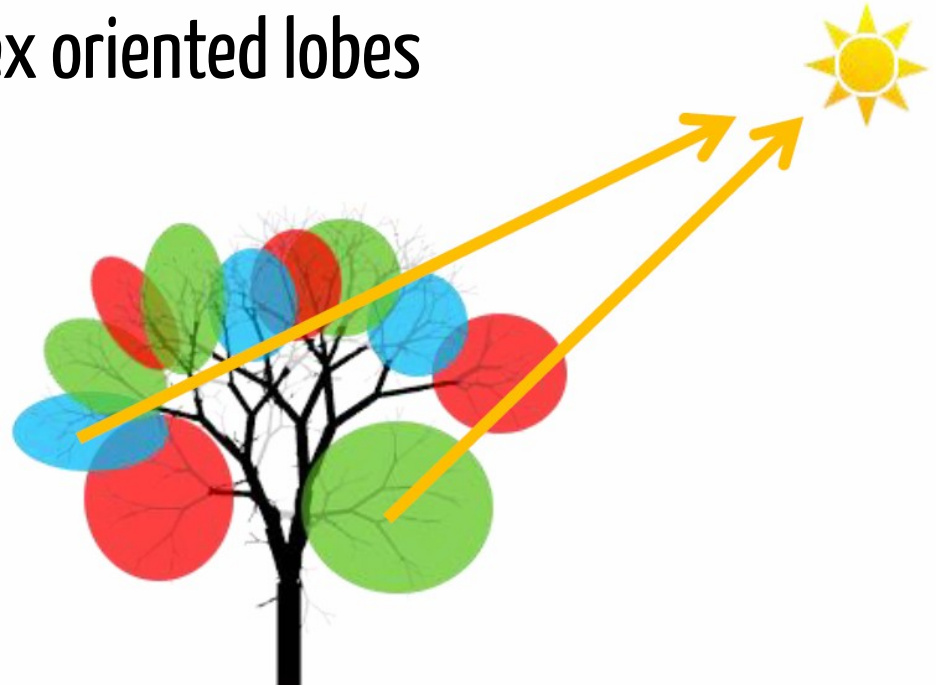
Livny et al 2011

VS.



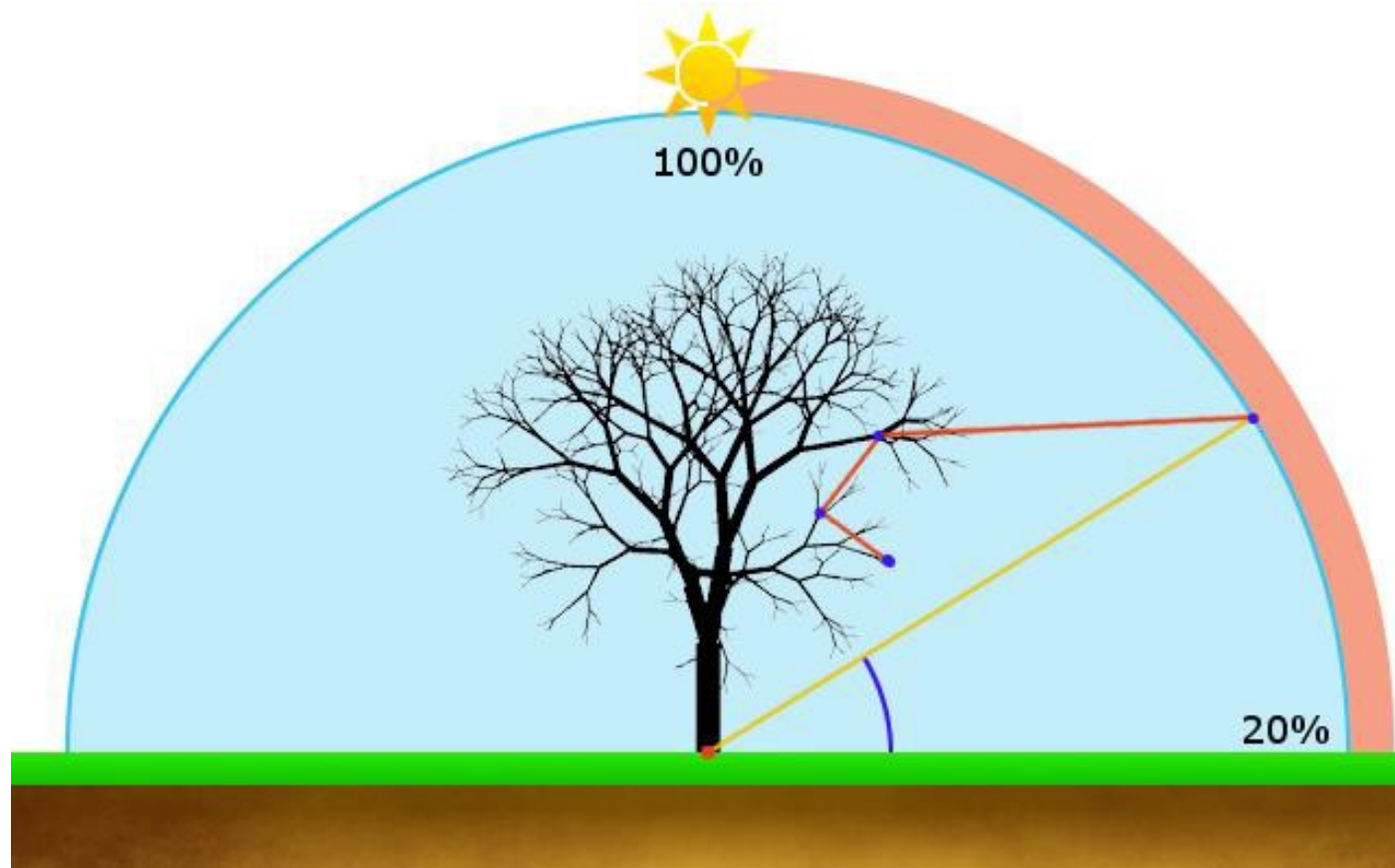
Leafcluster

- Octree vs. kdtree vs. vertex oriented lobes
- $f(V, \Delta M, d, S)=L$
 - V – *Volumen*
 - ΔM – *Entfernung zum Rand*
 - d – *Dichtefaktor*
 - S – *absolute Lichtmenge*
 - L – *resultierende Lichtmenge*



Light within a tree

Absolute Lichtmenge

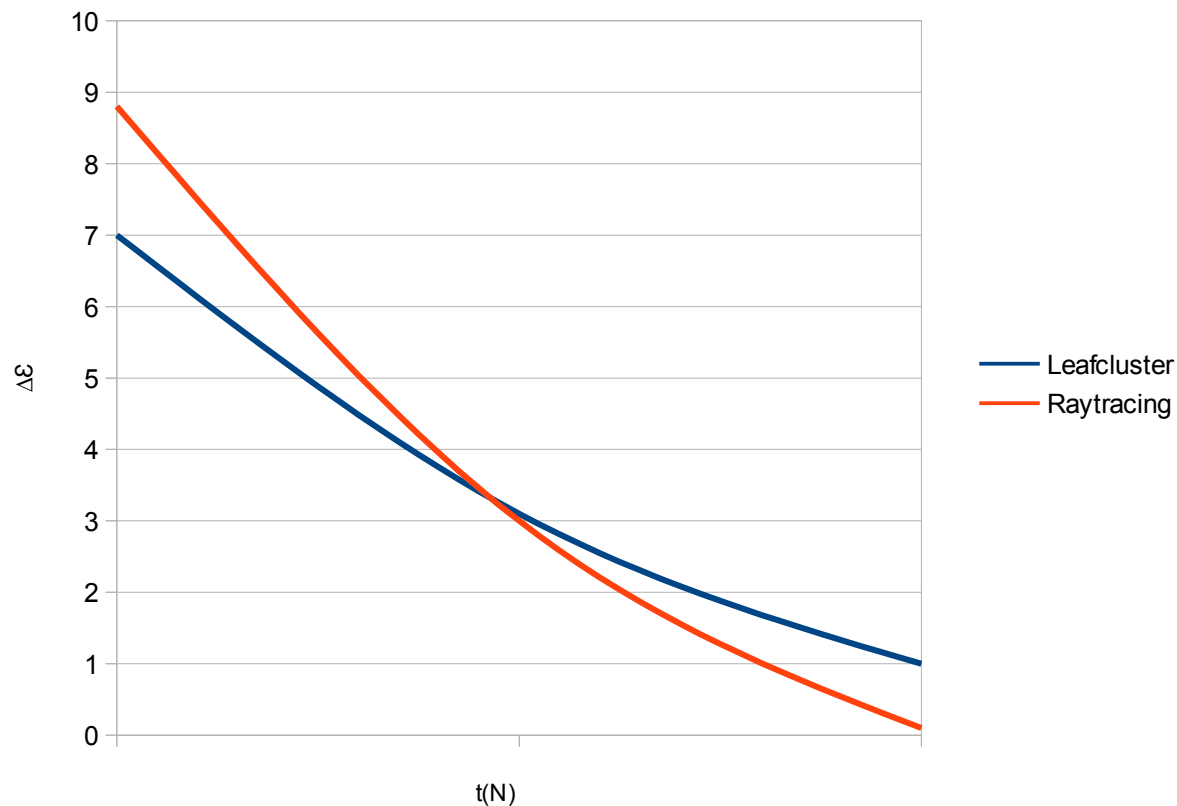


Raytracing

- Different distributions of rays (evtl. Montecarlo)
- $L = \sum L_1 * n_1 \dots L_N * n_N * 1/N$
- n – Blattnormale

Leafcluster vs. Raytracing

- Fehler, Performance (erwartet $\sim 1/x^3$)



Other approaches

- Atomics (frag)

Pruning of dynamically generated trees

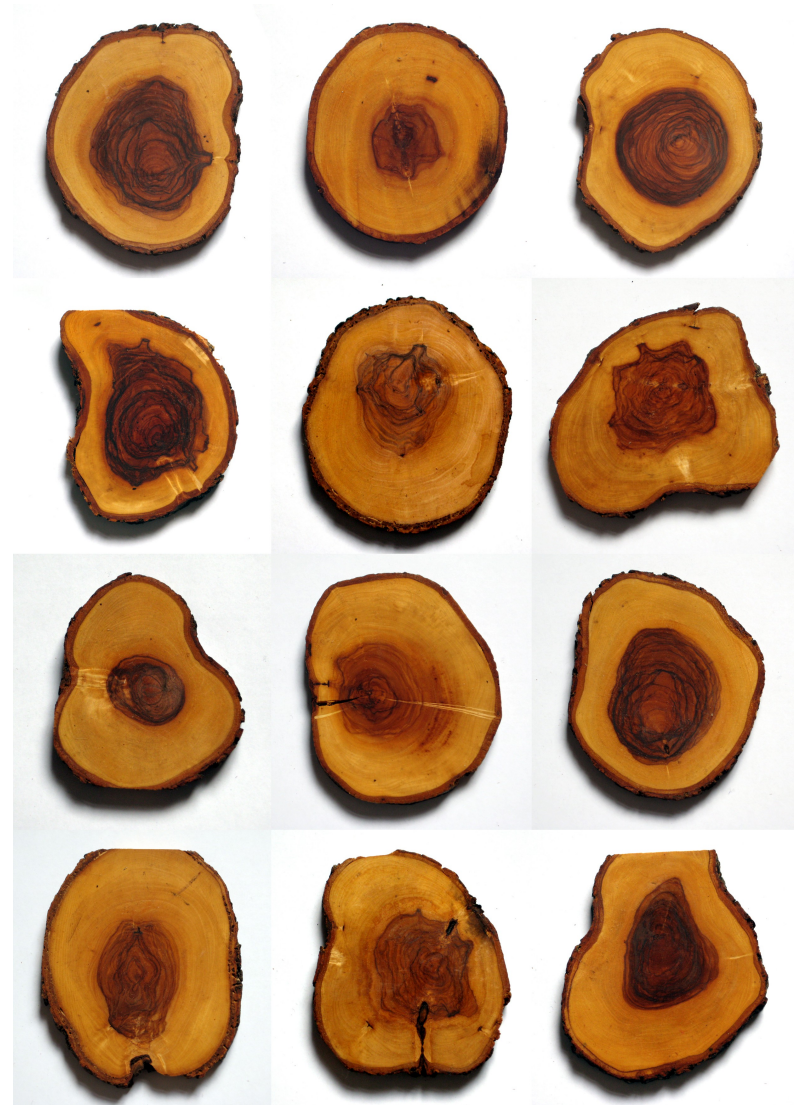
$$\{F+\underline{FF}/F\} \dashrightarrow \{F/F\}$$

Procedural growth dependent growth rings

Procedural growth dependent growth rings

- Age
- Species
- Branches (current and dead)
- Currently bezier patches in processing
- TreeHugger

AKAGI, Y., & Kitajima, K. (2012).
A Study on the Animations of Swaying and Breaking
Trees based on a Particle-based Simulation.
wscg.zcu.cz.



Procedural aging wine-leaves

Procedural aging wine-leaves

- Enhua Wu ?!?
- TreeHugger
- Inside Ivygenerator



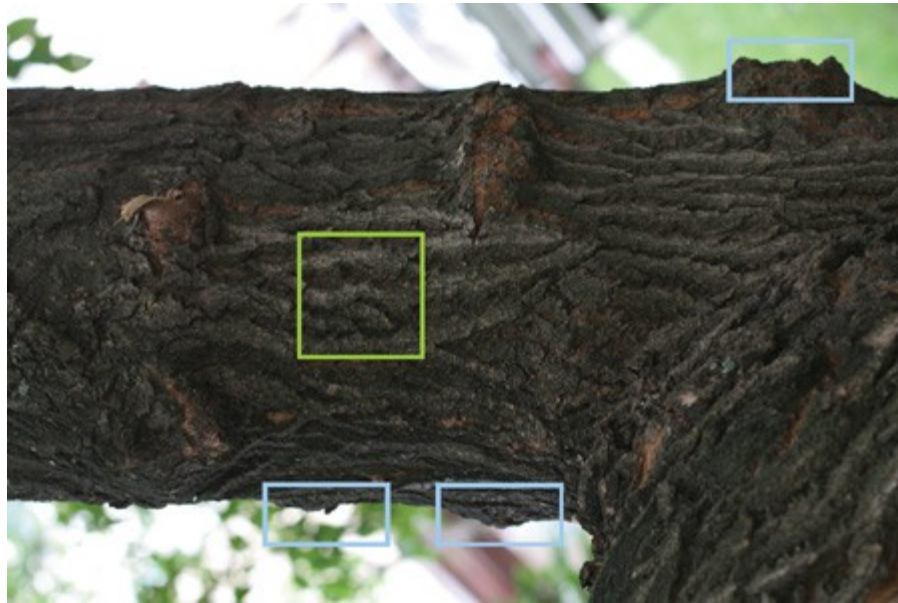
L-Systems and beyond



L-Systems and beyond

- Generalized cylinder
- Hybrid growth simulation for biological motivated trees
- Context sensitive L-Systems + biological rules
- Parameter:
 - P Neutrieb
 - P Tod
 - Richtung

Synthesizing bark using real-time tessellation



Synthesizing bark using real-time tessellation

- dynamic age-dependent bark rendering using real-time tessellation
- Parameters depth and width (of bark) according to age
- July, S. A. N. F., & Bloomenthal, J. (1985). Modeling the Mighty Maple, 19(3).
- Hart, J., & Baker, B. (1996). Implicit modeling of tree surfaces. Proceedings of Implicit Surfaces' 96, 1–10.
- Lefebvre, S. (2002). Synthesizing bark. Proceedings of the 13th Eurographics workshop.
- + GPU Gems3 - Chapter 4. Next-Generation SpeedTree Rendering



- Buds for life (in the guts)
 - Axillary bud
 - Leaf bud
 - Accessory bud
 - Proventiv vs adventiv

Funding

Funding #1 – Forst

- Göttingen, Eberswalde, Tharandt, Wien

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- Daniel Wessolek (BUW, Buffalo)
- "Grundlagen moderner Architektur und Entwerfen" (Universität Stuttgart)
- Joachim, Mitchell (NYU (former: MIT, Harvard, Toronto, Buffalo))

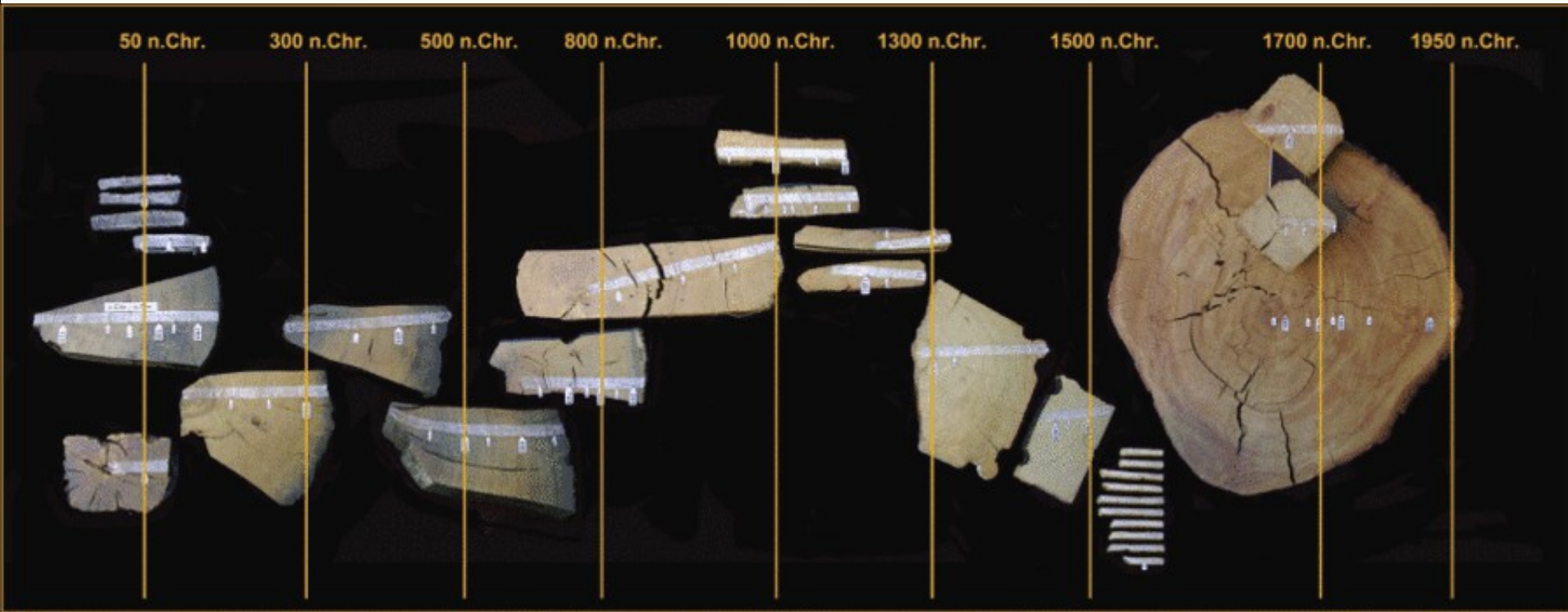


Funding #2 – Baubotanik

- Bidlingmaier, Baulngs



Funding #3 – Dendrochronologie



- Cornell, Linah Ababneh
- Tharandt, Ultraschall
- Girona, Hardware?

Thank you for your attention !



More information:
<http://www.uni-weimar.de/medien/cg>

References