seit 1558

Friedrich-Schiller-Universität Jena

Rechnerarchitektur und Advanced Computing

A New Approach to Visualizing General Trees
# Using Thickness-adjustable Quadratic Curves

### M. Ali Rostami, Azin Azadi, H. Martin Bücker

Motivation

- The tree expansion in different direction is visualized.
- Thicknesses of tree curves illustrate the size of expansion in each direction
- The thicknesses are completely adjustable.
- Based on Holton [1] Model, the thicknesses can be also automatically adjusted.
- The Algorithms are implemented in GraphTea [2],[3].

1. Holton, M.: Strands, gravity and botanical tree imagery. Computer Graphics Forum 13(1), 57–67 (1994)
2. Rostami, M.A., Azadi, A., Seydi, M.: GraphTea: Interactive Graph Self-Teaching Tool. In: Proc. 2014 Int. Conf. Edu. & Educat. Technol. II. pp. 48–52 (2014)
3. Rostami, M.A., H. Martin B´cker, A.A.: Illustrating a Graph Coloring Algorithm Based on the Principle of Inclusion and Exclusion Using GraphTea. In:
Proceedings of Ninth European Conference on Technology Enhanced Learning (EC-TEL) 2014. Accepted for Publication (2014)
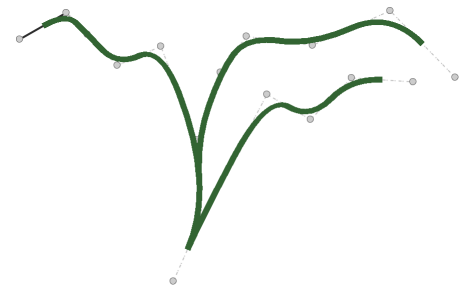
GraphTea
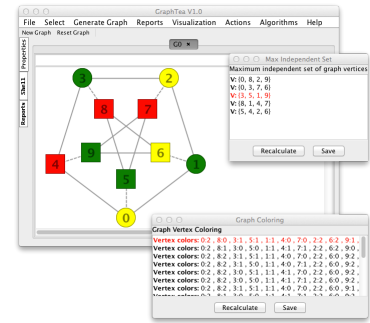
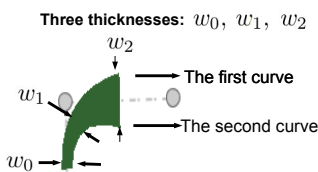## Quad Parameter Curves With a Fixed Thickness
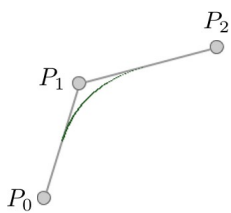
$$B(t) = (1 - t)^2 P_0 + 2(1 - t)t P_1 + t^2 P_2, t \in [0, 1]$$

B(t) for each three nodes of the tree and connecting these curves
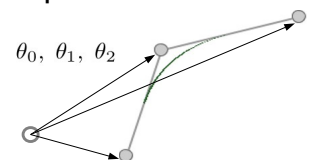
Adjustable Thicknesses

- **Two Boundary Curves**

Three thicknesses: $w_0, \ w_1, \ w_2$

The first curve

The second curve

- **Widths in which the boundary curves are drawn apart**

$$S = \frac{w_0 + w_1}{2}, M = w_1, E = \frac{w_1 + w_2}{2}$$

- **The angles between position vectors**
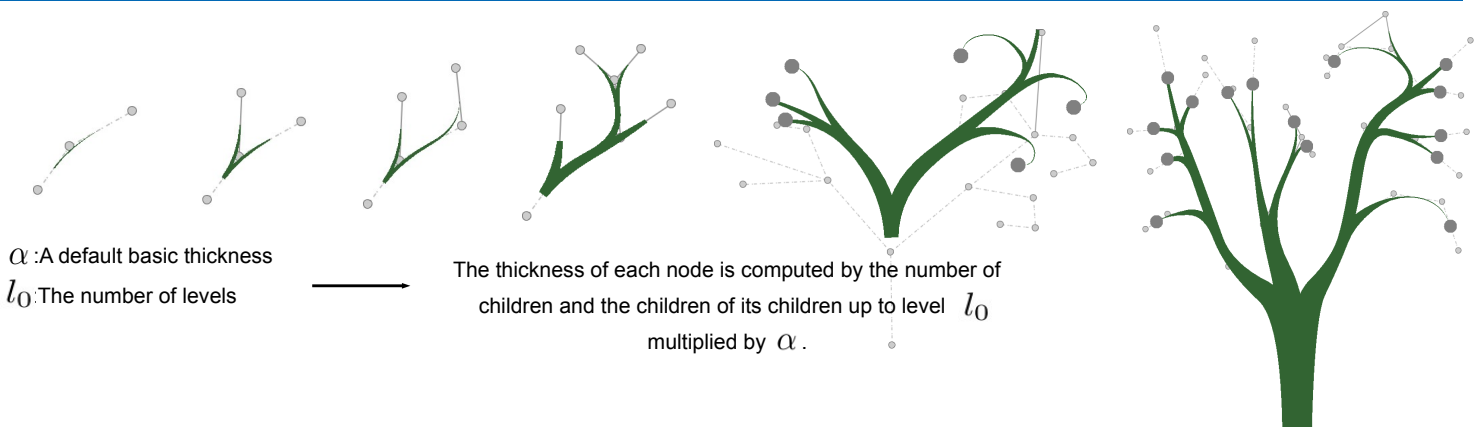
$$\theta_0, \ \theta_1, \ \theta_2$$

- **Control points for two Boundary curves**

$$\{P_0 - SR(\theta_0), P_1 - MR(\theta_1), P_2 - ER(\theta_2)\}$$
$$\{P_0 + SR(\theta_0), P_1 + MR(\theta_1), P_2 + ER(\theta_2)\}$$

where $$R(\theta) = \begin{bmatrix} cos(\theta) \\ sin(\theta) \end{bmatrix}$$

Automatic Thickness Adjusting

α :A default basic thickness

l_0:The number of levels

The thickness of each node is computed by the number of children and the children of its children up to level l_0 multiplied by α .