Bauhaus-Universität Weimar

Randomly Generated Trees

HTML5 Canvas & Javascript

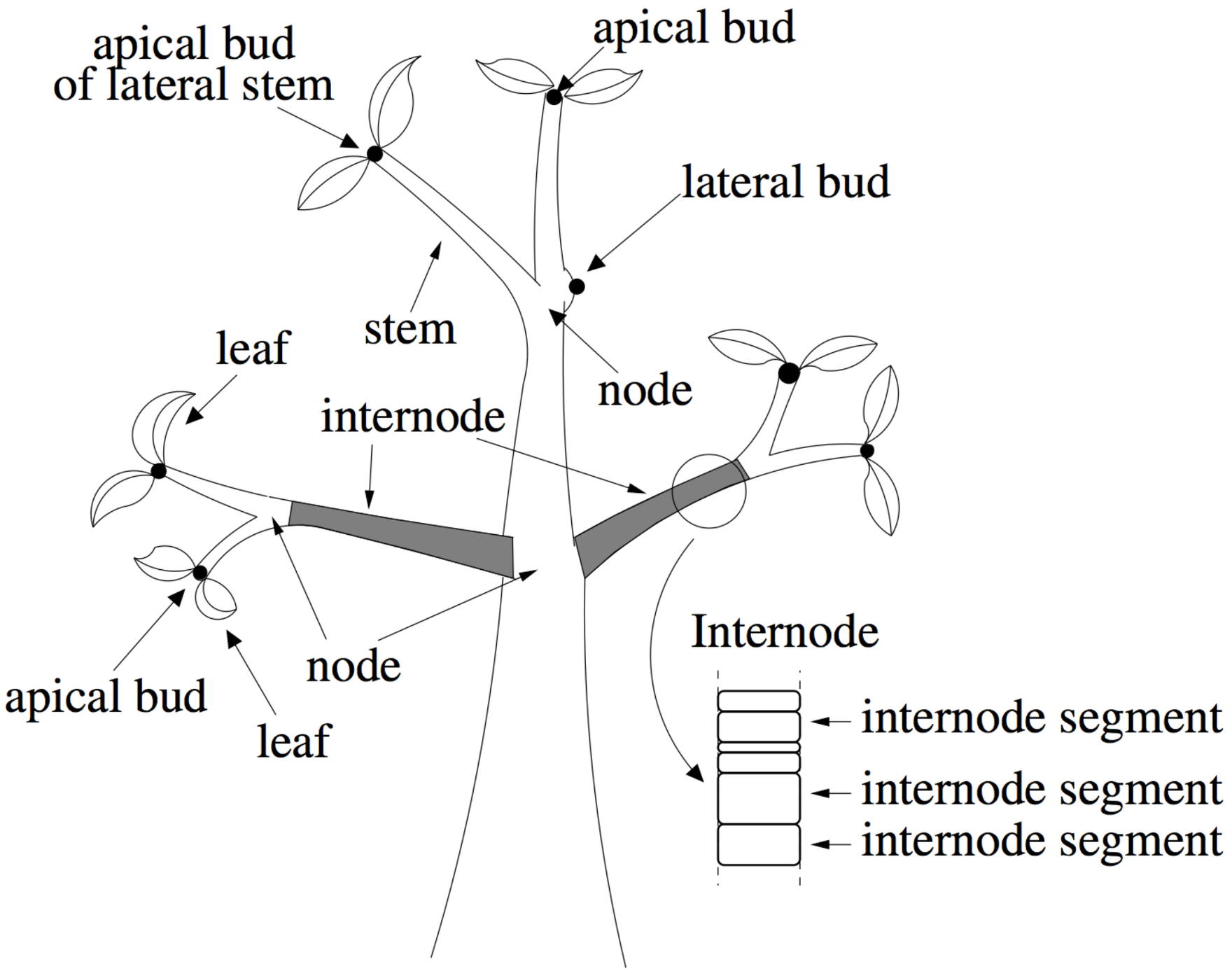
Johannes Lerdon • Treehugger • Final Presentation • WS 2013/2014

Initial Concept & Goals

- Generating visually appealing trees on mobile devices (web)
- Researching theoretical tree and plant growth concepts
- **Choosing a qualified drawing environment (API)**
  - HTML5 Canvas
  - WebGL Not available on mobile devices
- Searching for existing qualified classes simulating tree growth
- Offering interaction to manipulate the tree growth
- Attempting to implement biological correct mechanisms

Basic Growth Model

- **Stem Growth**
  - Increase in height through additional internode segments
  - Lateral growth by increasing segment width
- **Apical bud movement**
  - Remains at tip of stem
- **Nodes**
  - Follows stem growth and its generic internode length
- **Branching Angles**
  - Lateral stems form at certain angles to their parent stem



[Zhuming Lam & Scott A. King 2005]

Algorithm & Factors

- **Random Walk**
  - Generating branches at different randomized angles
  - Taking previous segments into account
  - Unique trees still showing a common pattern
- **Phototropism**
  - Different growth direction and distribution based on lighting conditions
- **Space Tropism** Not Implemented
  - Taking other branches into account while growing
  - Obstacle avoidance for „external“ objects

Class Parameters

- branch_split (int)
- branch_width: (int)
- branch_length: (int)
- branch_length_divider: (int)
- branch_color: (hex or function)
- angle: (float)
- angle_max: (float)
- angle_divider: (int)
- leaf: (boolean)
- leaf_radius: (int)
- leaf_area: (int)
- leaf_multiplier: (float)
- leaf_color: (hex or function)
- leaf_stroke_color: (hex or function)

Research Papers

- „Voxel space automata: modeling with stochastic growth processes in voxel space“ (1989) N. Greene NYIT Computer Graphics Lab, Old Westbury, New York

- „Simulating tree growth based on internal and environmental factors“ (2005) Zhuming Lam Allied Press Ltd, Dunedin, New Zealand
  Scott A. King Texas A&M University, Corpus Christi, Texas

- „Simulating Plant Growth“ (2001) Marco Grubert Technical University of Berlin

- „Visual Models of Plants Interacting with Their Environment“ (1996) Radomır Mech and Przemyslaw Prusinkiewicz University of Calgary

Live Demo