The Sketch L-System: Global Control of Tree Modeling Using Free-form Strokes

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Outline

- Introduction
- Related Work
- L-Systems
- User Interface
- Discussion
- Conclusion
- Extensions
- Questions

Introduction

- The paper proposes a new Tree modeling system based on L-systems.
- It allows the user to control the overall appearance and the depth of recursion
- User can model a new tree just by drawing a single stroke

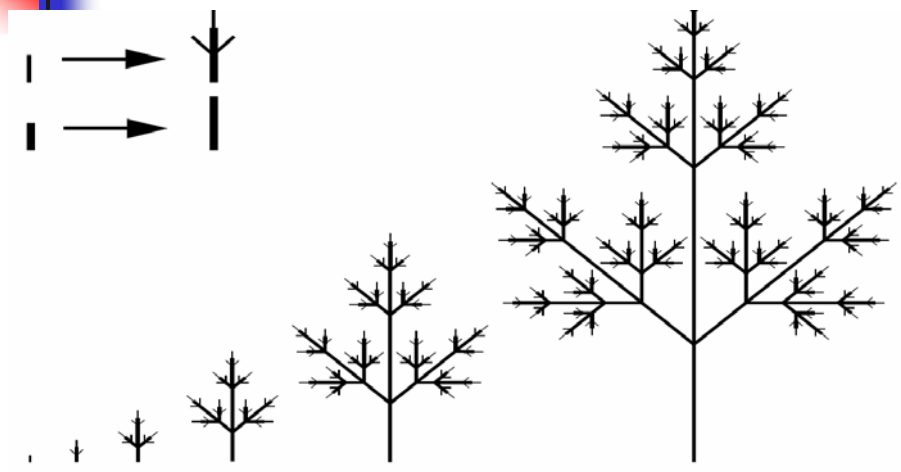
Related Work

- L-system
  - Defines structure and rewriting rules
- Plant modeling
  - L-system based
  - *L-String* for defining structure
- Sketch-based interface for 3D modeling
  - Sketch, Teddy, flower modeling system.

L-System

- A formal grammar
- Constructs fractal structure by applying rewriting rules sequentially
- Most famously used to model plant development
- Introduced by a biologist from Hungary , Lindenmayer in 1968

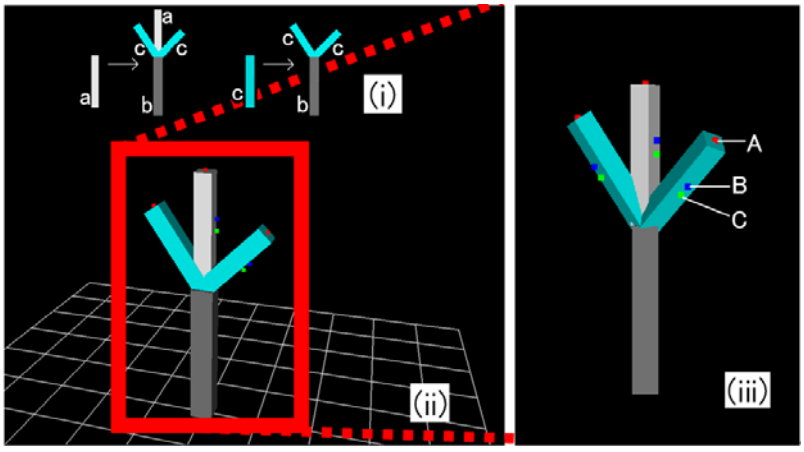
L-System



Sketch L-system

- Manipulation of the generating rule and its parameters
- Geometry creation by drawing a stroke

Manipulation of generating rule and parameters



Rules Terminology

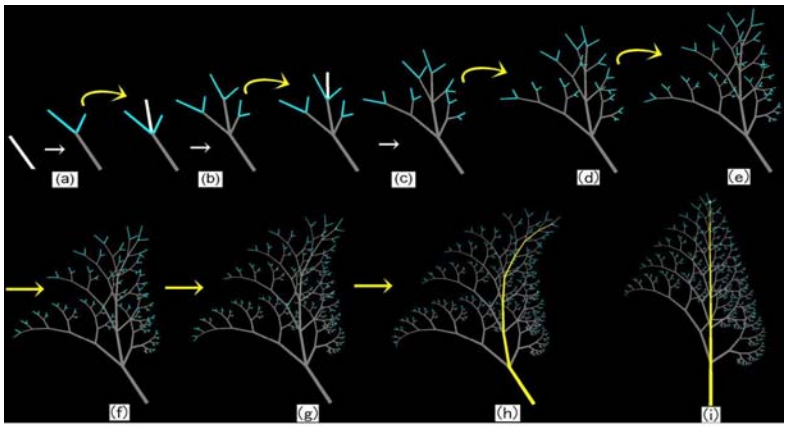
- Top apex – “a”
- Lateral Apices – “c”
- Inter-node – “b”
- Central Axis – User drawn stroke

Manipulation Parameters

- A – Length and the orientation about the Central Axis
- B – Orientation about its own vertical axis
- C – Width of the node

Geometry Creation

- A Free-form user drawn stroke



Camera/View

- Rotation:
  - Barrel button + pen move
- Zoom In/Out:
  - Middle Mouse button + pen/mouse move

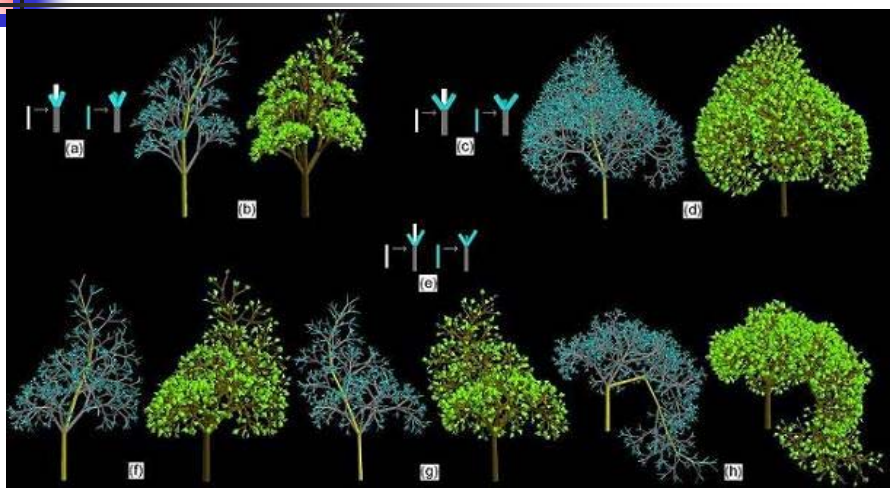
Discussion

- Most current systems don't allow to specify global structure and local parameter manipulation
- E.g Typical L-system structures are defined by strings as "F -> F+[F+F-]" where F is the branch and +,- are rotations, they either used random values for parameters or they are fixed values

Discussion Contd.

- Sketch-Lsystem allows for global control by allowing the user to specify the direction and the depth of the growth
- It also allows for local parameter manipulation

Results



Applications/User Study

- Implemented as a digital art tool for handheld devices

Limitations

- Predefined rules
- The central axis/user stroke will always lie in a single plane
- User study missing

Conclusion

- A simple, intuitive interface
- Ability to manipulate while your drawing
- Could be used a learning tool for understanding use of L-systems for modeling of trees
- Lot of room for improvement using gesture based interface

Extensions

- Support for drawing the rules instead of having predefined rules
- Generic L-system modeling tool;
  - Visualizing other L-system based fractal structures
- Multi-stroke functionality

Questions?