Simulation of Tree Growth

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Abstract

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2 Background

2.1 Tree Structure and Terminology

This section covers the terminology used when describing trees. The choice of language is based on the description of trees by (Barthélémy and Caraglio, 2007).

A tree consists of a number of nodes. Each node supports nodes further out in the tree.

- A *node* is the main component of the tree. It supports at least a bud, another node or a leaf. A node combined with an internode is called a *metamer*. (Barthélémy and Caraglio, 2007)

- An *internode* is the section of stem between two nodes.

- The *lateral branch* is a supported node that is connected at an angle to the supporting node.

- The *main branch* is a supported node that has the same angle as the supporting node.

- *Buds* are potential points for expansion of new nodes. A lateral bud is located at the node that already has a main branch. An apical bud is located at a node that has no branches to support.

For this project, a tree grows by shooting a number of new metamers from a bud. This is called rhythmic growth and is the more commonly observed method of growth in nature. (Barthélémy and Caraglio, 2007) The fate of a bud and the number of new metamers depends on a number of factors. For this project, only a simulated light resource was considered.

A node is given an order based on the number of node below it. A node without a supporting node has order 1.

2.2 Volumetric Light Scattering

Volumetric light scattering (also called "godrays" or "crepuscular rays") is a light phenomenon that occurs when the mixture of gas and molecules in the air is just right. This causes light to be rayleigh-scattered and creates visual sun beams through the air. (See Figure 1.)

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Figure 1: An example of volumetric light scattering. (Sunshine Kodai Kanal, Manoj K Racherla, 2013)

3 Method

3.1 Tree Generation

3.2 Volumetric Light Scattering

3.3 Shadow Mapping

4 Result

5 Discussion

5.1 Improvements

References

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