CompSci 102
Discrete Math for Computer Science

April 24, 2012

Prof. Rodger

Announcements

- Final exam is Friday, May 4 at 7pm
  - in LSRC D106

- Additional reading on graphs, trees:
  - Chap. 10.7-10.8, Chap 11.1

Review for Final

- Same topics as Test 1 and Test 2 (see review pages for them)
- Topics since Test 2
  - Probability Chap 7.1-7.4
  - Recurrence Relations 8.1-8.3
  - Graphs, trees 10.1-10.4, 10.7-10.8, 11.1

Classwork

- Show that a simple graph is a tree

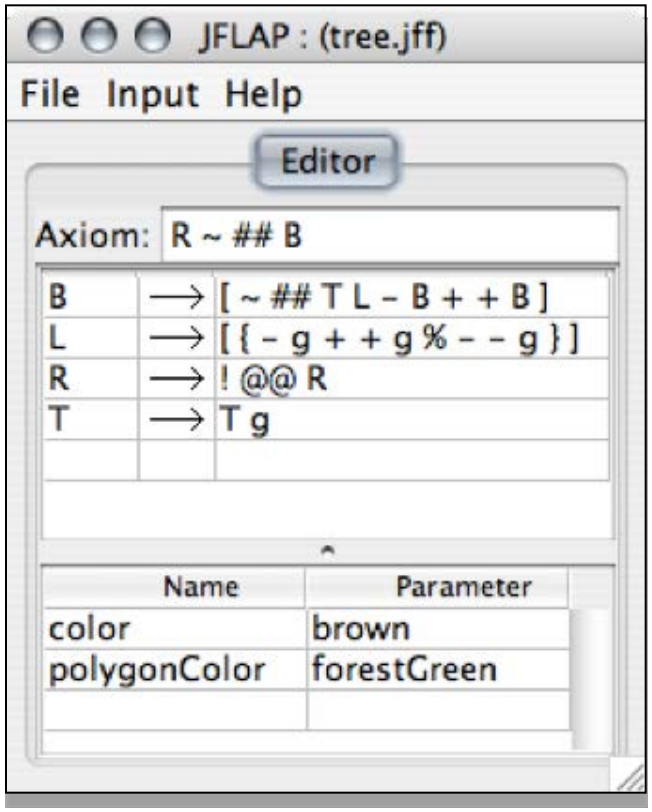
  if and only if

it is connected but the deletion of any of its edges produces a graph that is not connected.

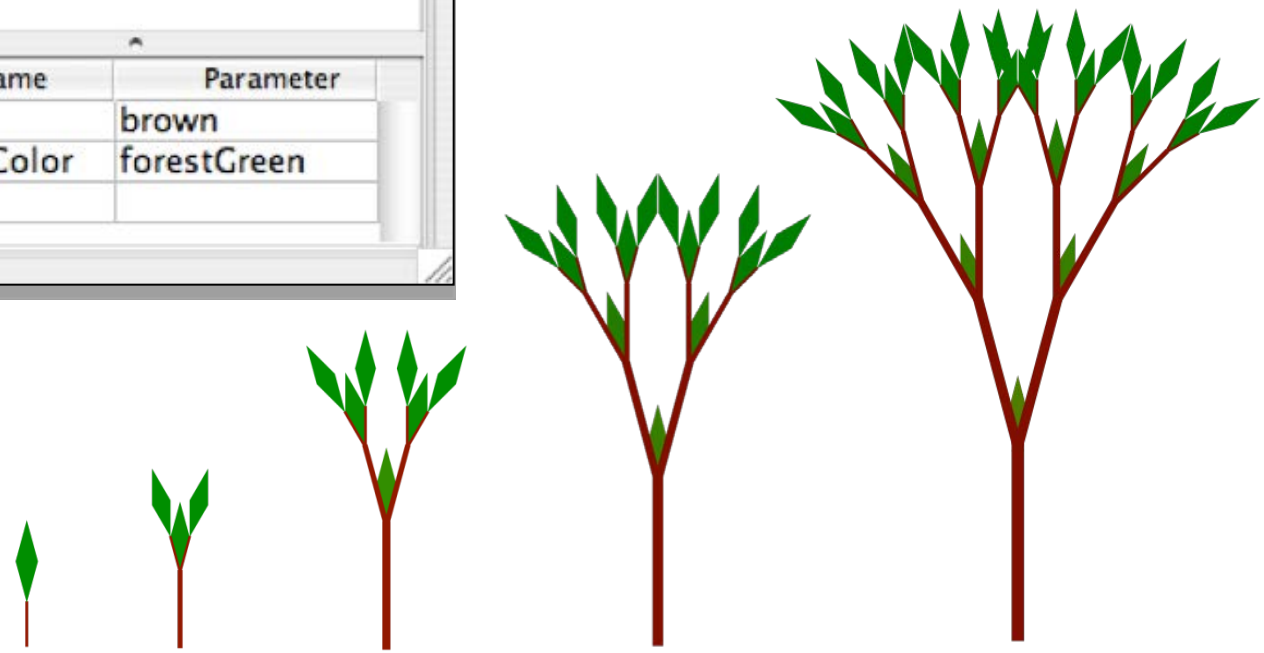
Discrete Math – Why?

- Automata theory and formal languages (CompSci 140)
  - How do compilers work?
    - How does the compiler know my program is not syntactically correct?
  - How do you model the growing of plants and organisms, fractals?
    - L-Systems

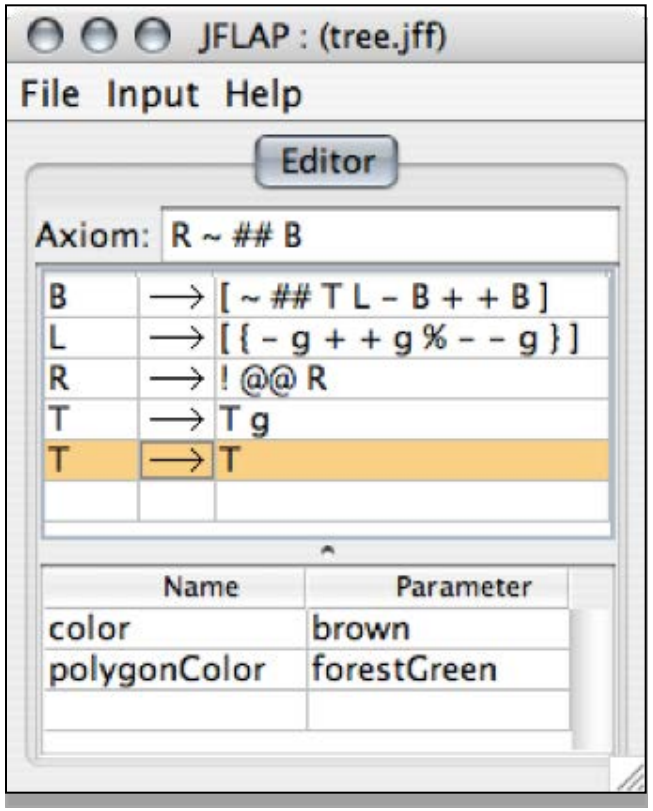
JFLAP - L-Systems



- This L-System renders as a tree that grows larger with each successive derivation step.



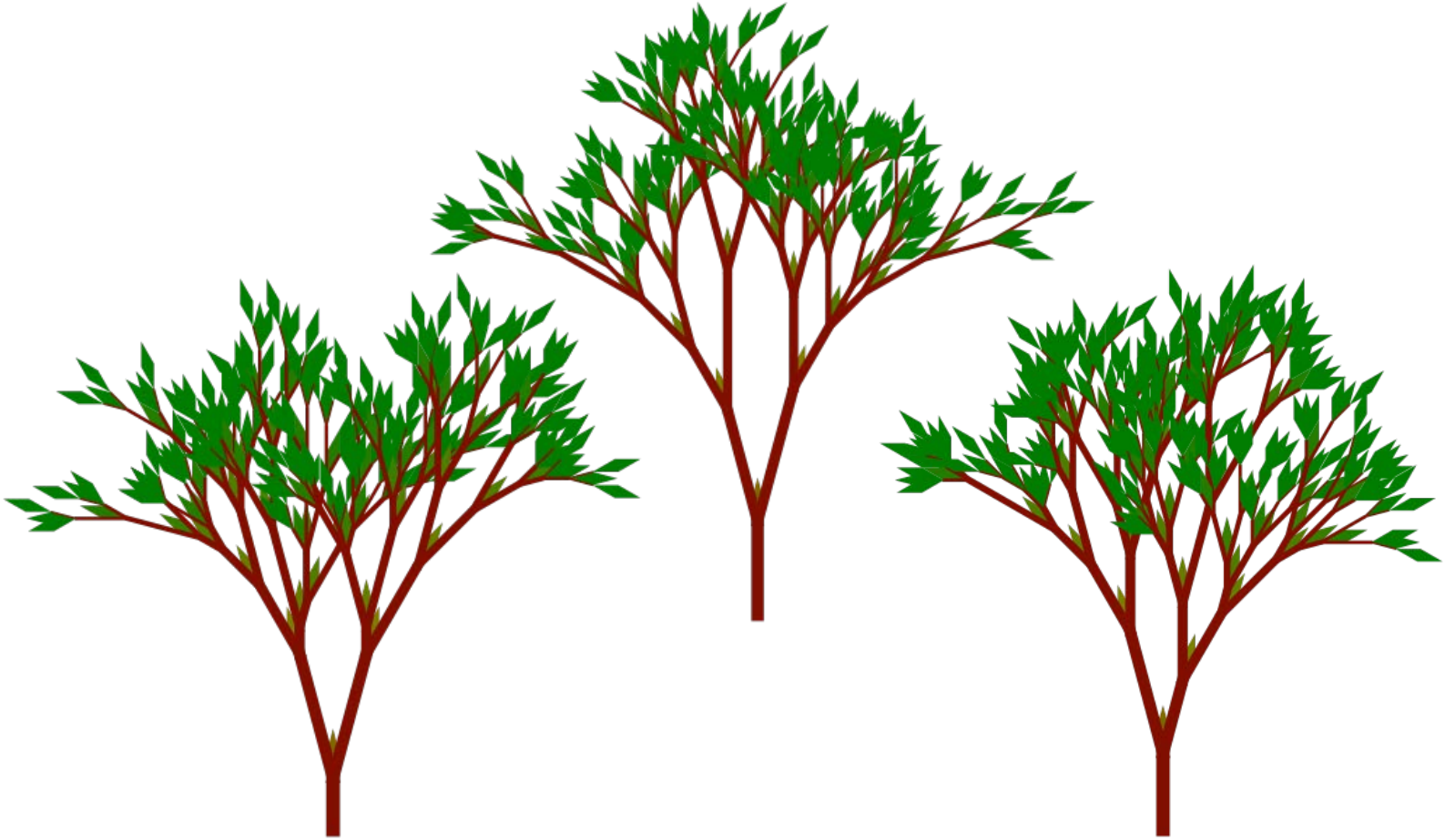
L-Systems



- L-systems may also be stochastic.
- The $T \rightarrow Tg$ rule adds g to the derivation, which draws a line segment.
- We add another rewriting rule for T, $T \rightarrow T$.
- With two rewriting rules for T, the rule chosen is random, leading to uneven growth!

L-Systems

The same stochastic L-system, rendered 3 different times all at the 9th derivation.



Graph Theory

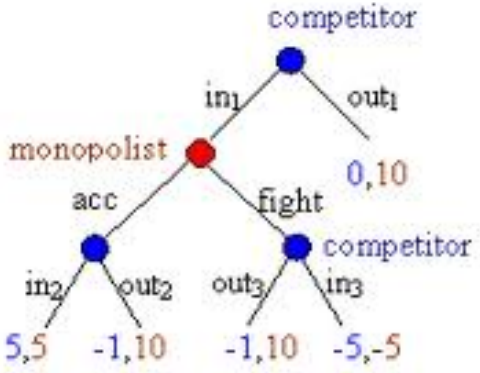
- Analyzing the internet, social networking problems, many problems that are modeled by graphs
- Touchgraph

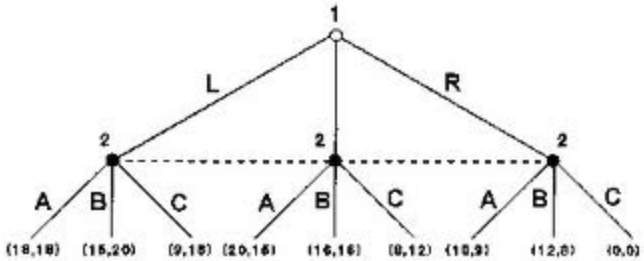
  from

  Facebook

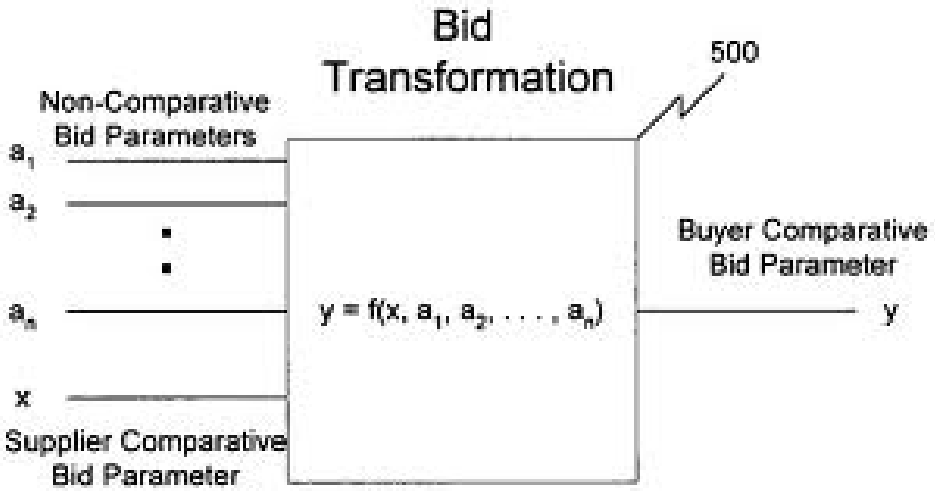
Game Theory

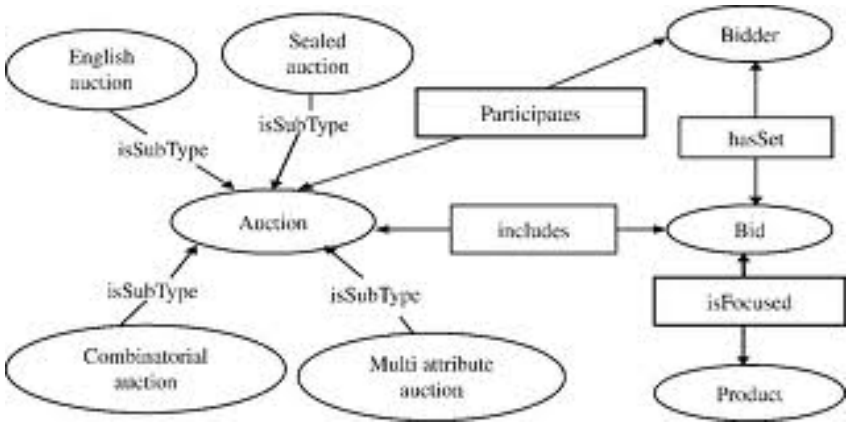
- Strategic decision making
- “the study of mathematical models of conflict and cooperation between intelligent rational decision-makers” – Roger Myerson





Electronic auctions





Conferences

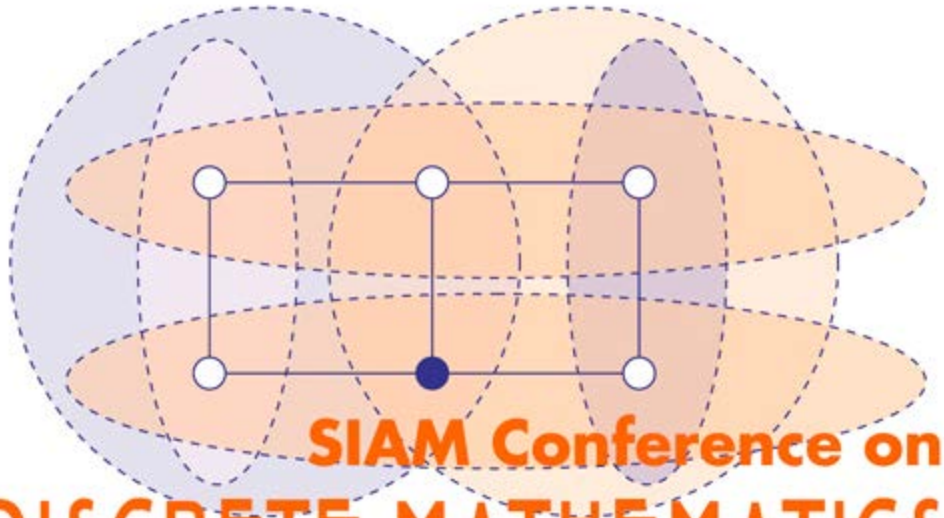


Figure courtesy Victor Chepoi, Hans-Juergen Bandelt, David Eppstein from SIDMA 24-4

June 18-21, 2012
Dalhousie University
Halifax, Nova Scotia, Canada

Discrete Mathematics, including:

- Design Theory
- Enumeration
- Extremal Combinatorics
- Graph Theory
- Combinatorial Algorithms
- Ordered Sets
- Algebraic Combinatorics
- Topological and Analytical Techniques in Combinatorics
- Probabilistic Combinatorics
- Combinatorial Number Theory
- Discrete Geometry
- Ramsey Theory
- Matroids

With connections to other disciplines including:

- Computer science
- Computational biology
- Optimizatin
- Probability
- Game theory