CS 253 Theory of Computation

Laboratory topics are investigated using the JFLAP software tool. JFLAP was developed at Duke University by Susan Rogers and supports construction and testing of abstract machines and languages. Programming projects are implemented in C++. Example project topics include: deciding whether an NFA accepts some string w, conversion of an NFA to a DFA, conversion of an NFA to a CFG, and conversion of a CFG to Chomsky Normal Form.

L-SYSTEMS LAB

These images were rendered with JFLAP and the grammars are modifications of examples presented in the "Algorithmic Beauty of Plants" by P. Prusinkiewicz and A. Lindenmayer.

3D Bush Axioms

Start axiom, A;
A --> @@ [& F L ! A] / / / / / # [& F L ! A] / / / / / / / # [& F L ! A];
F --> S / / / / / F g;
L --> [^ ^ { - g + g + g - % - g + g + g }];
S --> F L;

3D Flower Axioms

Start axiom, P;
F --> F g;
FL --> [& & & PE / W / / / / W / / / / W / / / / W / / / / W];
I --> F g S [/ / & & L] [/ / ^ ^ L] F g S;
L --> [polygonColor=darkOliveGreen { + g - g g - g + % + g - g g - g }];
P --> I + [P + FL] - - / / [- - L] I [+ + L] - [P FL] + + P FL;
PE --> F g F g;
S --> F g F g;
W --> [^ F g] [polygonColor=orangeRed { & & & & - g + g % - g + g }];

Students develop an original Lindenmayer System Grammar and use the JFLAP tool to graphically render a 2D or 3D image of the grammar. For a brief introduction to Lindenmayer Systems see

the following resources:

1. http://www.biologie.uni-hamburg.de/b-online/e28_3/lsys.html - An Introduction to L-Systems

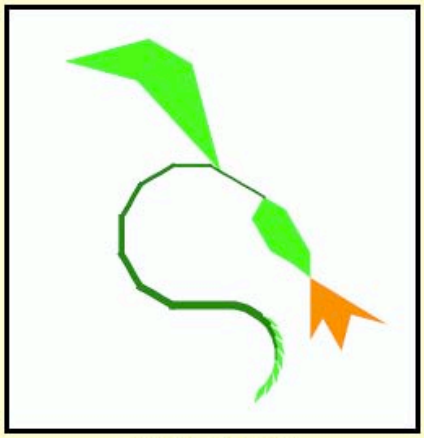
2. http://www.ee.uwa.edu.au/~braunl/lgrammar/java/ - An online Java Applet to generate L-Systems

3. http://www.biologie.uni-hamburg.de/b-online/lsystjava/LSys.html - Another online Java Applet to generate L-Systems

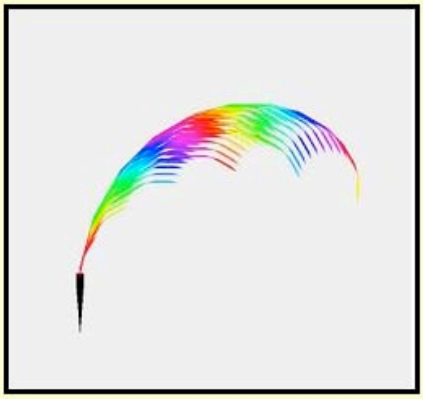
4. http://www.cpsc.ucalgary.ca/Research/bmv/vmm/animations.html - Online animations of plant growth from Univ. Calgary

Lindemayer System Lab Results

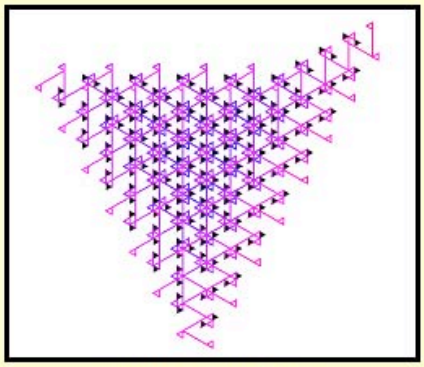
Starburst, Daniel Norris



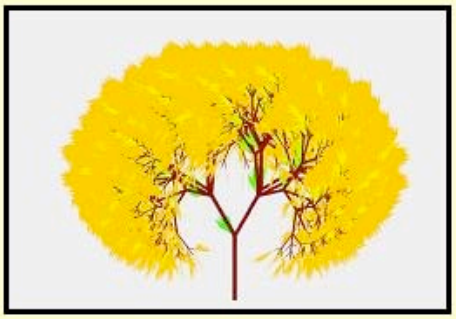
Dragon, David Mar



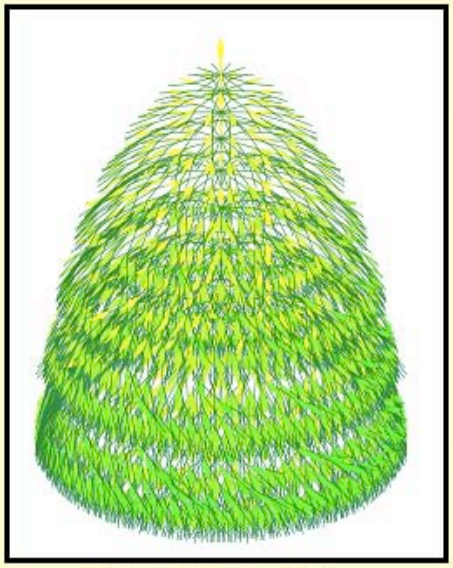
Quill, Josh Thomas



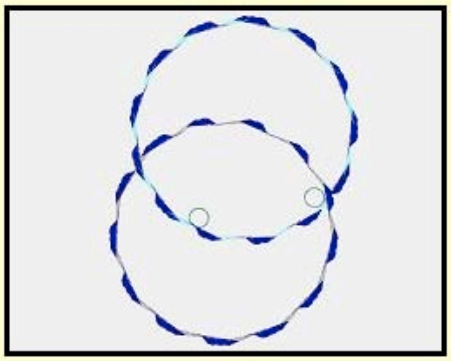
Geometric, Robert Taylor



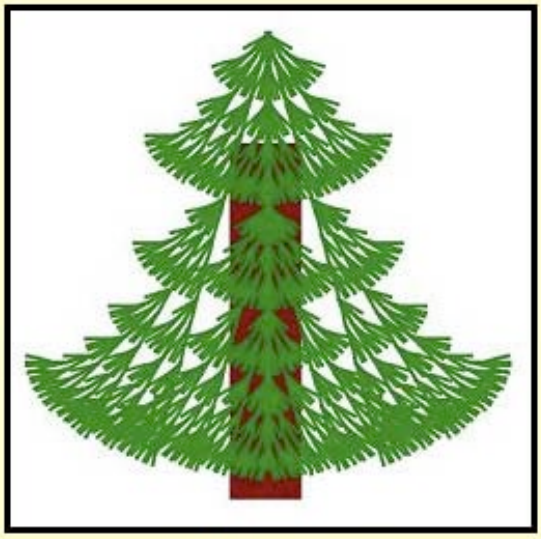
Tree, Andrew Courtney



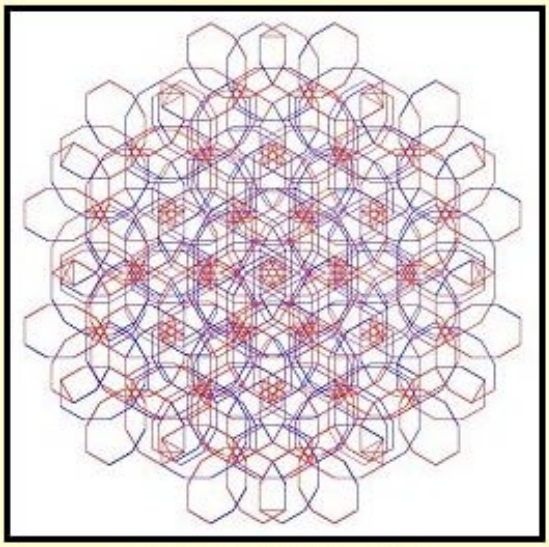
Christmas Tree, Ben Strecker



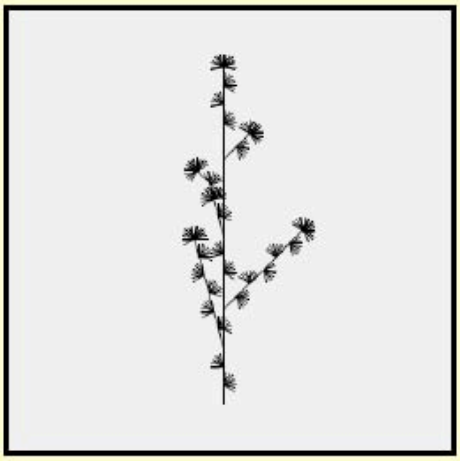
Geometric, Matt Snively



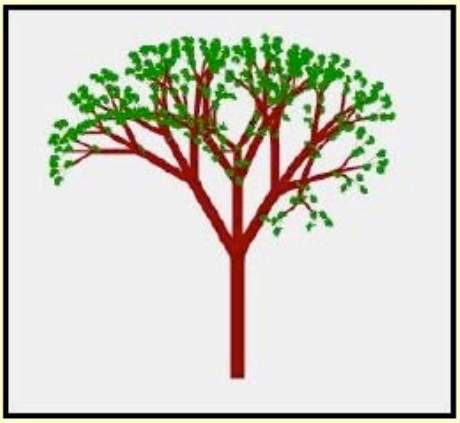
Tree, Mike Liberatore



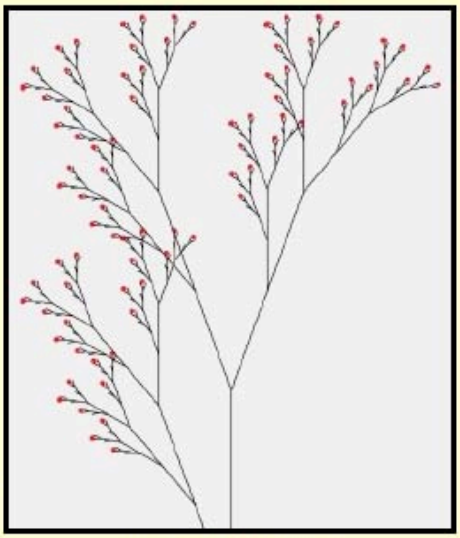
Geometric, Mike Liberatore



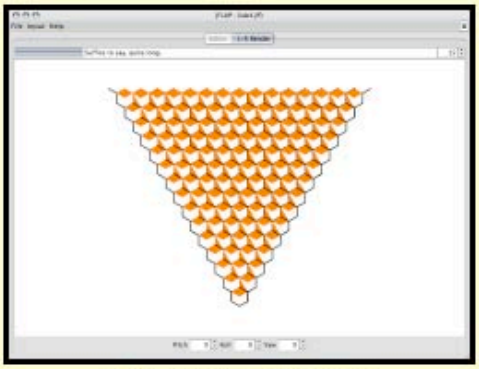
Plant, Andrew Beaudette



Tree, Mark Wellons

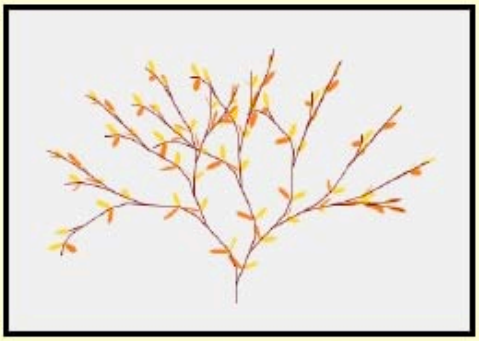


3D - Bush, Manoj Pageni



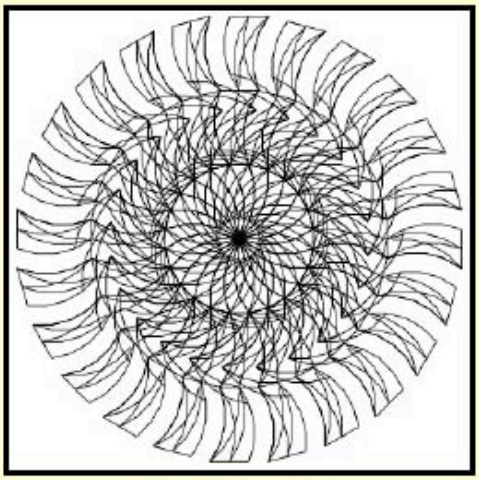
Infinite Stairs , Joe Pletcher

3D - Bush, David Sullivan



3D - Bush, Neha Murarka

Christmas Tree, Joseph Henrich



Spiral, Traian Andrei