gTangle

A Grammar for the Procedural Generation of Tangle Patterns

Lab Team

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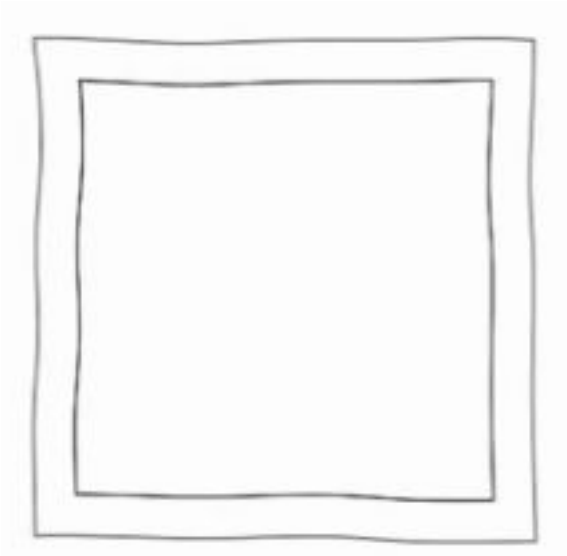
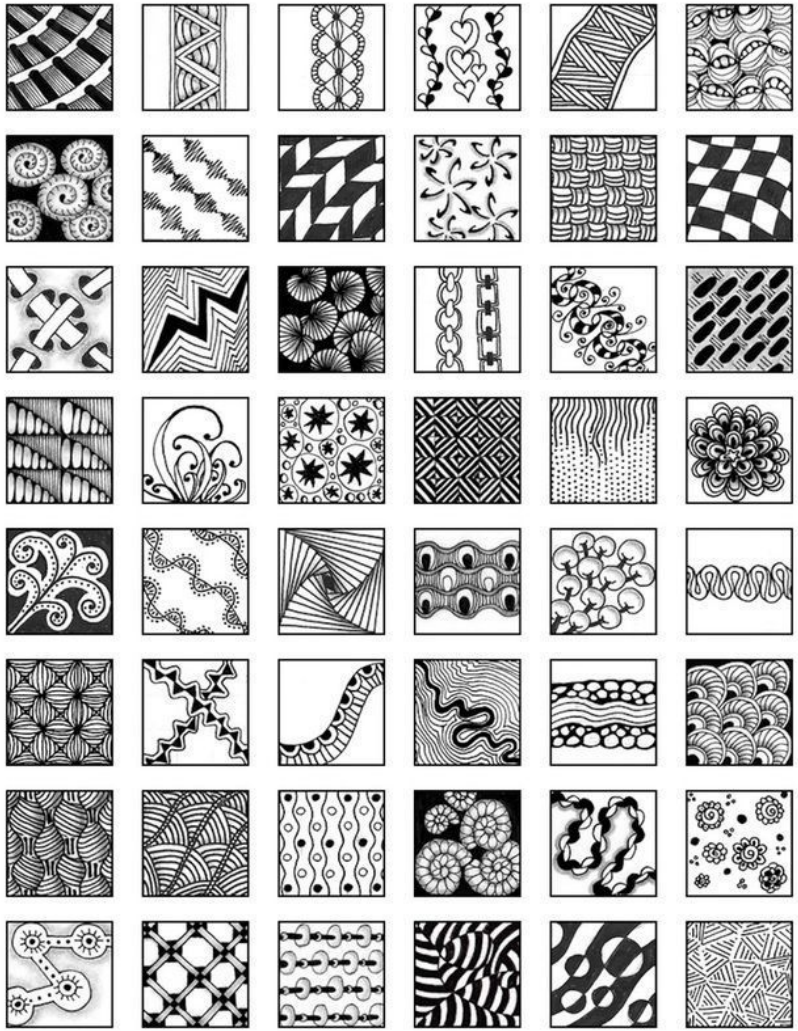
Tangles are a form of two dimensional structured pen and ink art created by a small set of basic strokes:

- Dots
- Straight Lines
- Curves
- Shapes

The tangles are generated by recursively splitting and combining initial set of polygons, using group grammars that perform operations on the polygons.

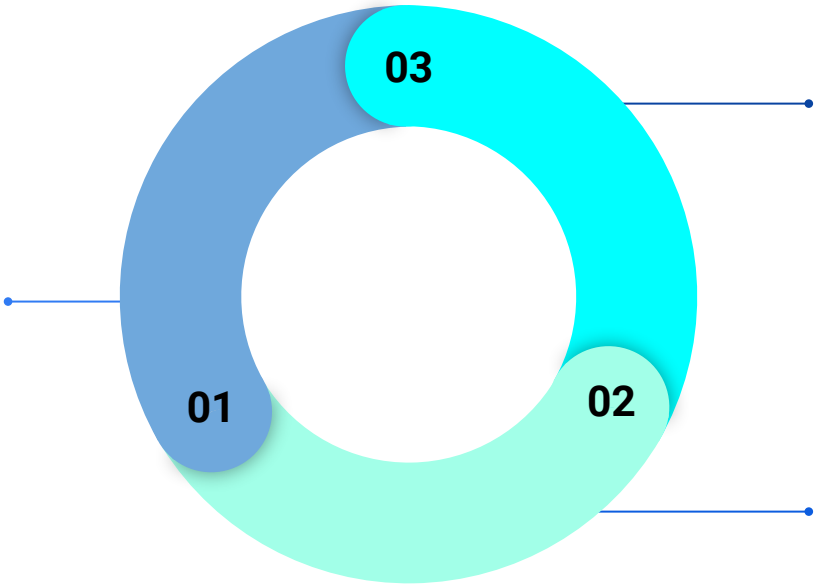




Purpose

Group Grammars Simplicity

Expressing complex tangles patterns and sub-pattern distributions, with relatively simple grammars.



Artistry

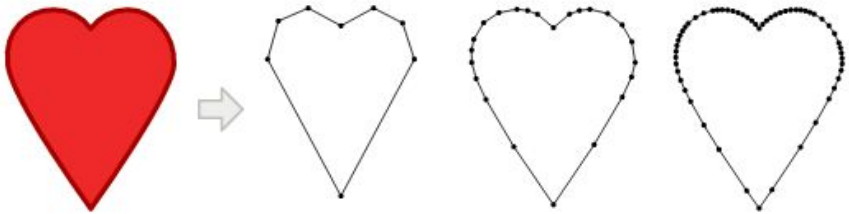
Tangles take artists hours of tedious and time-consuming work which can now happen quicker and with fine control.

Speed

Group grammars can, in few tens of seconds, produce a wide variety of patterns!

Grammar

Shape

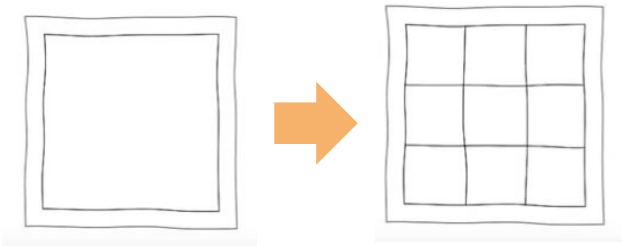


Geometric Shape

$$S = \langle t, g, s; \Theta, \mathbf{d} \rangle$$

Grammar Shape

Rules



Regular Split Rule Geometrically

$$R = O(\{p_o\}) : t_m \rightarrow [\langle t_0, g_0 \rangle, \ldots, \langle t_k, g_k \rangle]$$

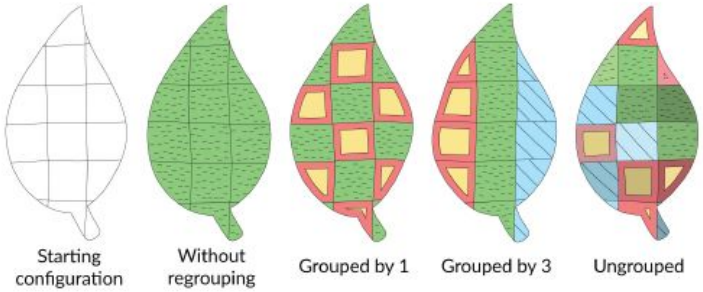
Production Rule In Grammar

Operators

Grouping Operators

$$ungroup() : t_m \rightarrow [\langle t', g_0 \rangle, \langle t', g_1 \rangle \dots \langle t', g_k \rangle]$$

$$regroup(k) : t_m \rightarrow [\langle t', g_0 \rangle \dots \langle t', g_0 \rangle \dots \langle t', g_k \rangle \dots \langle t', g_k \rangle]$$



Grouping Operators Geometry

Geometric Operators

$$regularSplit(c, o, x) : t_m \rightarrow [\langle t_0, g_0 \rangle, \dots, \langle t_0, g_0 \rangle]$$

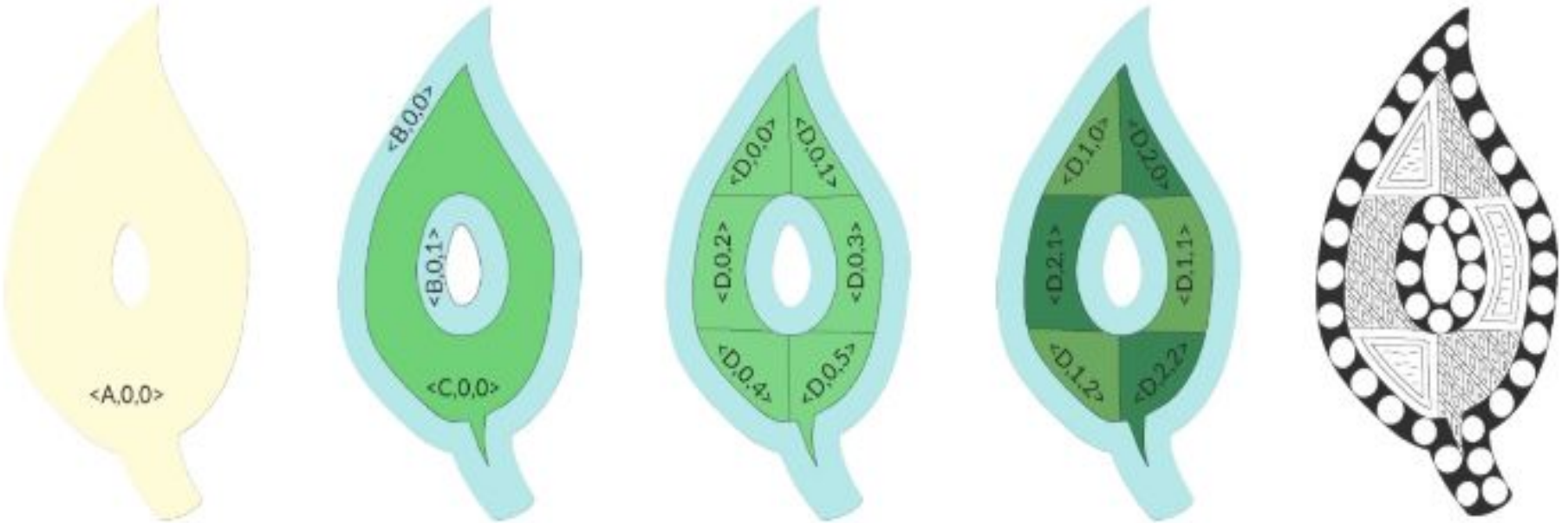
$$streamlineSplit(type, o) : t_m \rightarrow [\langle t_0, g_0 \rangle, \dots, \langle t_0, g_0 \rangle]$$

$$outline(d) : t_m \rightarrow [\langle t_{out}, g_0 \rangle, \langle t_{in}, g_1 \rangle, \dots, \langle t_{in}, g_1 \rangle]$$

$$place(s, d) : t_m \rightarrow [\langle t_{rem}, g_{rem} \rangle, \langle t_0, g_0 \rangle, \dots, \langle t_0, g_0 \rangle]$$

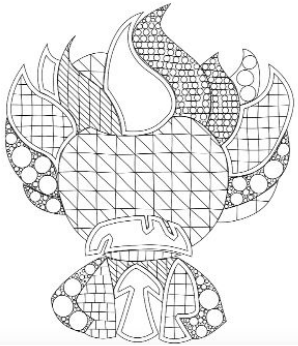
Geometric Operators Geometry

Recursive Operators



R_a = outline : A -> [B, C] R_b = regularSplit: C -> D R_c = regroup : D Final result

Iteration



Shape Perturbation

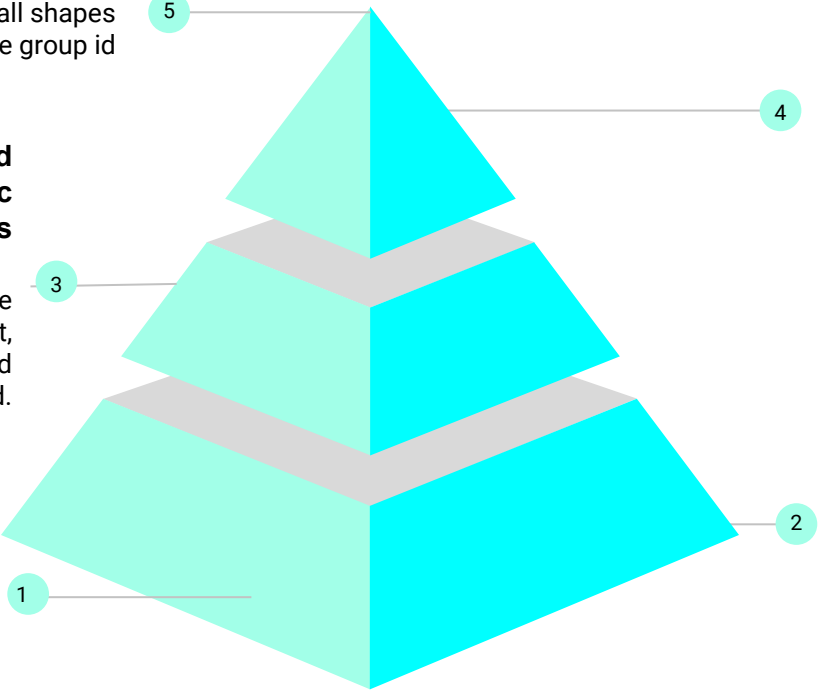
A coherent noise function that is applied to all shapes with the same group id

Grouping And Geometric Operators

The shapes are grouped, split, placed and outlined.

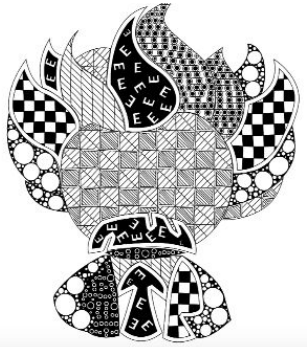
Input

An outline sketch in SVG format is provided as input



Decorative Operators

The shapes are filled and stippled



Tree

The SVG is stored as a tree data structure after being bisected into the elemental structures.

Scalable Vector Graphics

Results

Challenges

Challenge 1

Collaboration

With the online semester underway the difficulty of communication, debugging, pair programming and explaining code has become manifold.

Challenge 2

SVG Graphics

SVG defines the graphics in XML format.

The intricacies of SVG images, how they are drawn, stored structured and created and how to create them from code are all new problems for us.

Challenge 3

Recursive Tree Data Structure

While grammars bring mathematical finesse to the tangles on paper. The representation and manipulation of shapes using a graph in code is a hard problem to solve.

Progres
s

- Grammar tree data structure to store shapes and take tessellated polygons as input and output
- Structuring rules as JSON files and parsing them
- Grouping Operators

Overall:

52%

Completed!

Road Ahead

We are here!

Proposal Submission Reading related papers and literature review	Structuring the grammar as a tree 	Reading and parsing rules as JSON objects	Grouping Operators	Geometric Operators 	Decorative Operators	Shape Perturbation 	Testing And Creating Tangles!