Arrow
DESIGN ENVIRONMENT

Genetic Algorithms & Self-Organizing Maps in Computer-Aided Design

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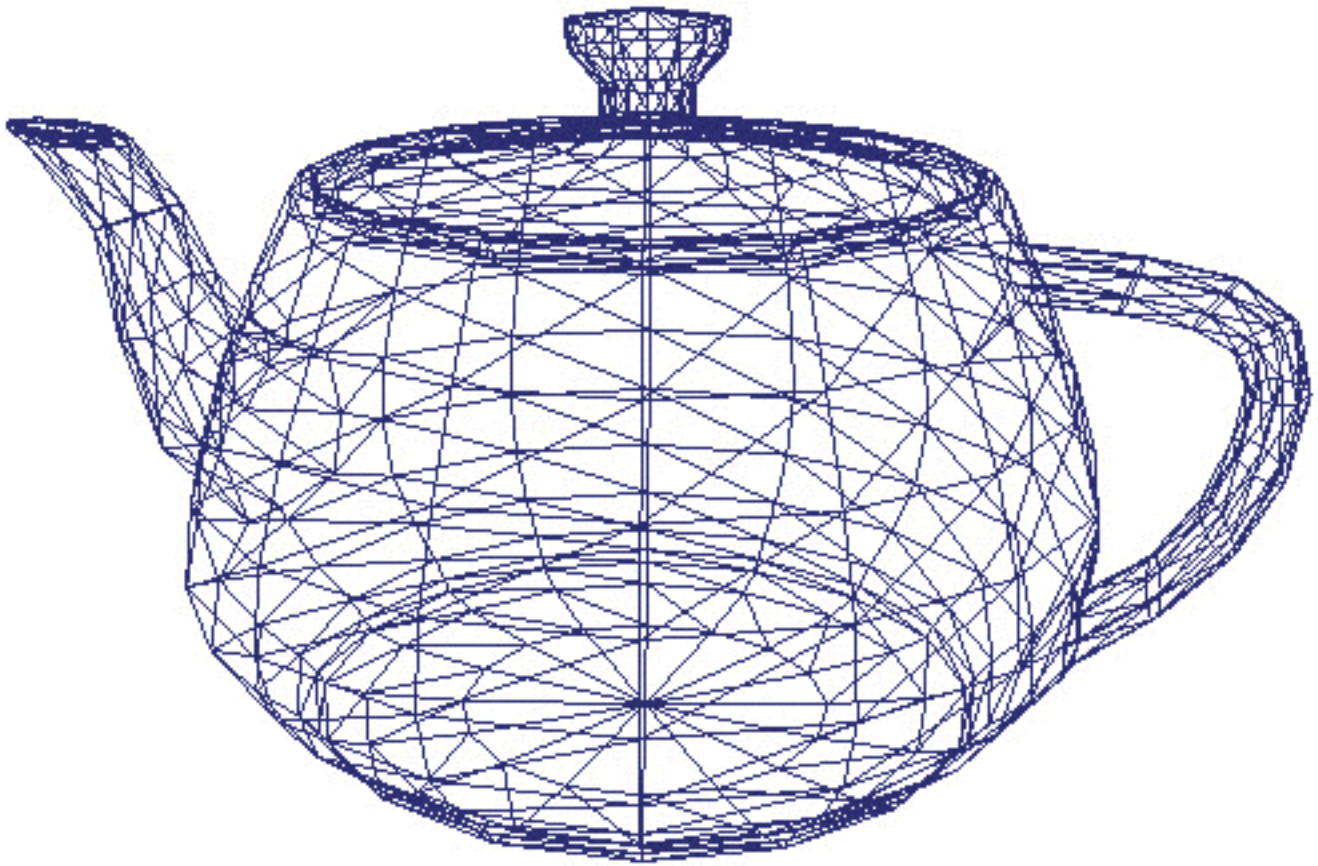
Step 1:

User generates multiple iterations of a design.

(In this example, a teapot)

Arrow | DESIGN VIEW | MAP VIEW



TOOLS

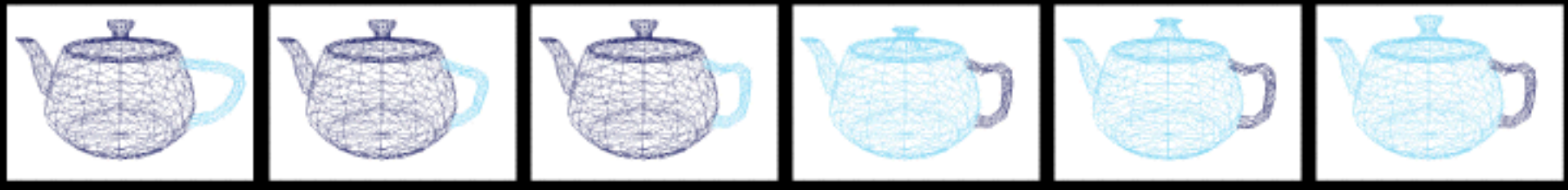
- ABSTRACT MODELING
- 2D MODELING
- 3D MODELING
  - + Sphere
  - + Cube
  - + Cylinder
  - + Cone
  - + Plane
  - + Torus
  - + Prism
  - + Pyramid
  - + Pipe
  - + Helix
  - Union
  - Intersection
  - Difference
  - Split Polygon
  - Subdivide Polygons
  - Smooth Polygons
  - Crease Polygon
- 3D PHYSICS

FORMS

- "Handle"
- "Kettle"

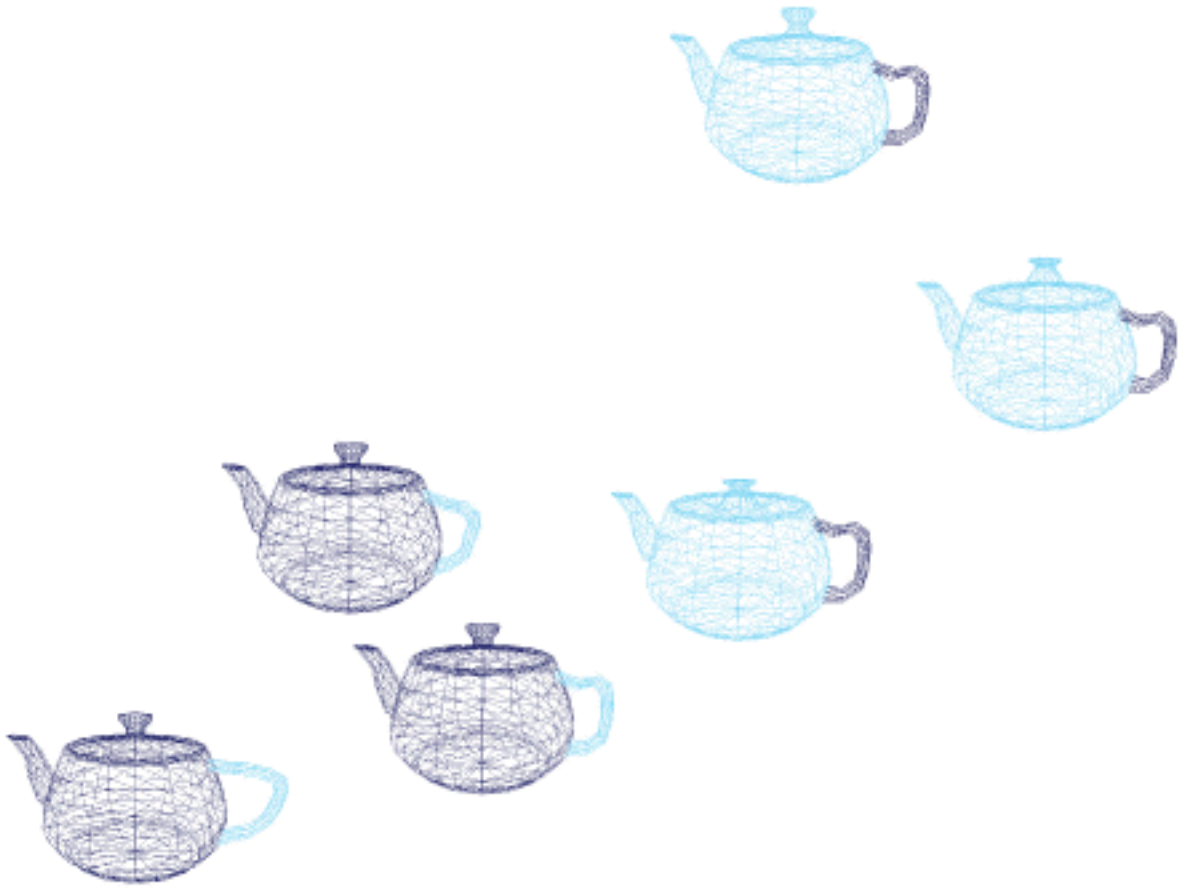
"HANDLE" ITERATIONS

ITERATIONS | STORE ITERATION



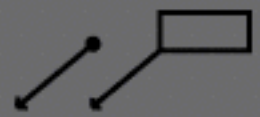
Step 2:

The Arrow environment generates a self-organizing map, which is a two-dimensional representation of how each iteration relates to the others in terms of their features.



ARROW MARKS

Growth Arrows

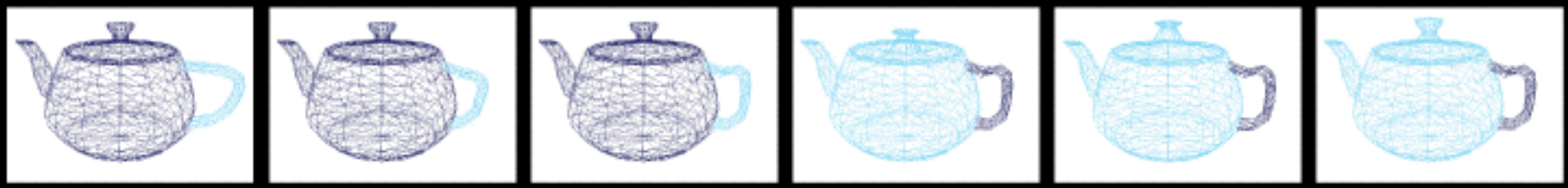


Wither Arrows

Walls

Gates & Funnels

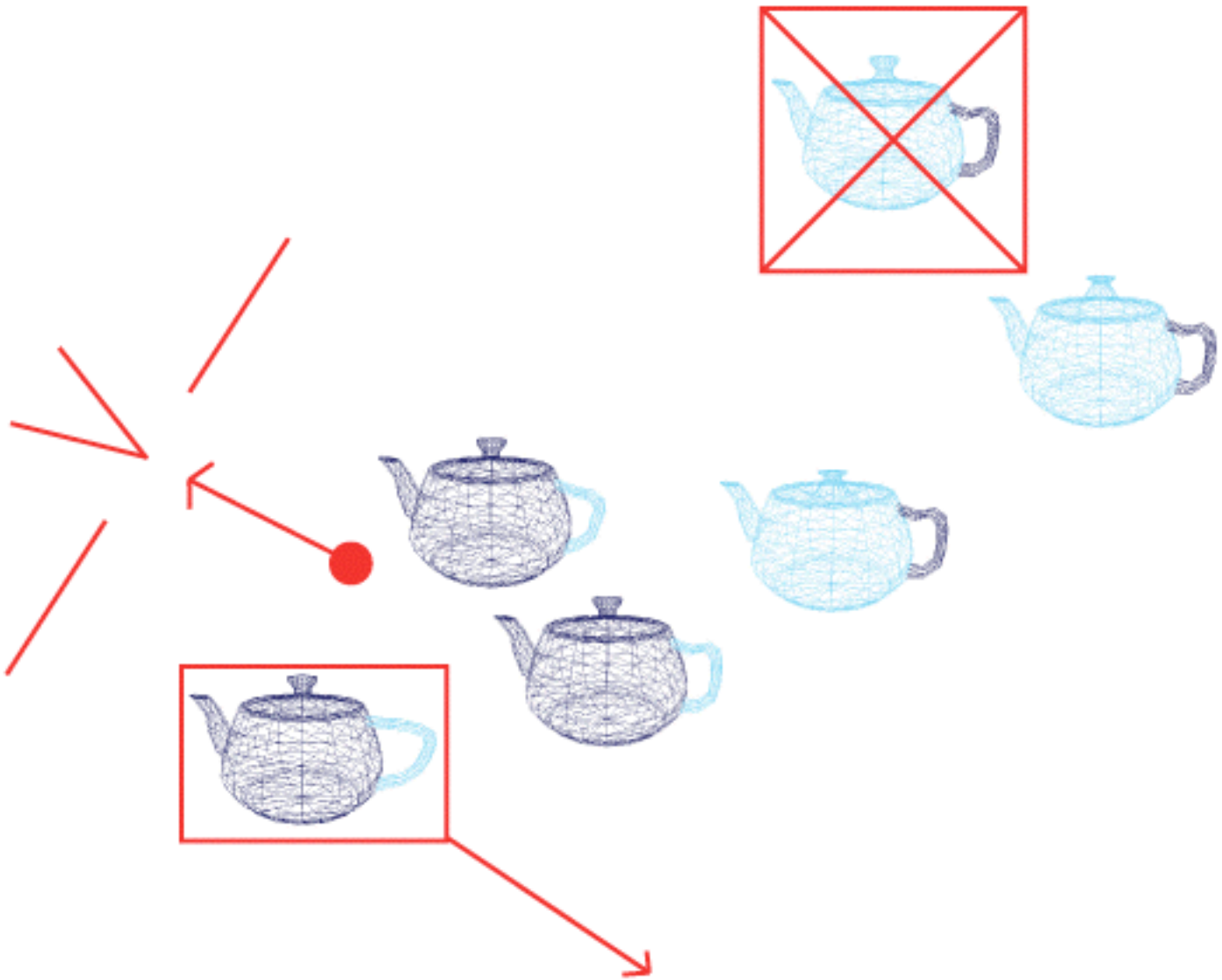
ITERATIONS



Step 3:

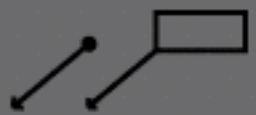
The user draws "Arrow marks" on top of the self-organizing map.
These marks indicate to the system's internal genetic algorithm which areas of the map's feature space are desirable directions for the automated generation of new design iterations.

Arrow | DESIGN VIEW | MAP VIEW



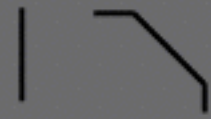
ARROW MARKS

Growth Arrows



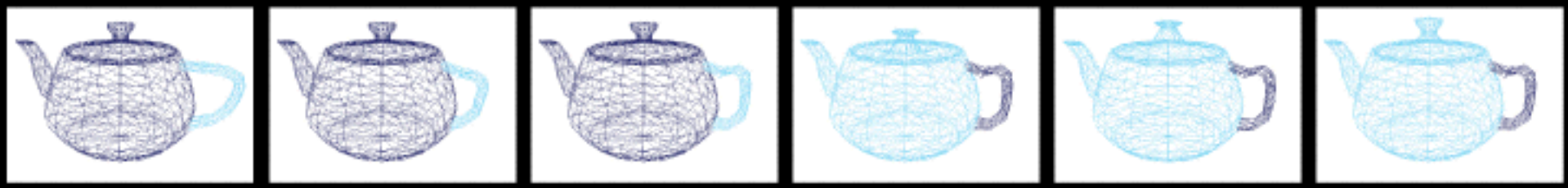
Wither Arrows

Walls



Gates & Funnels

ITERATIONS

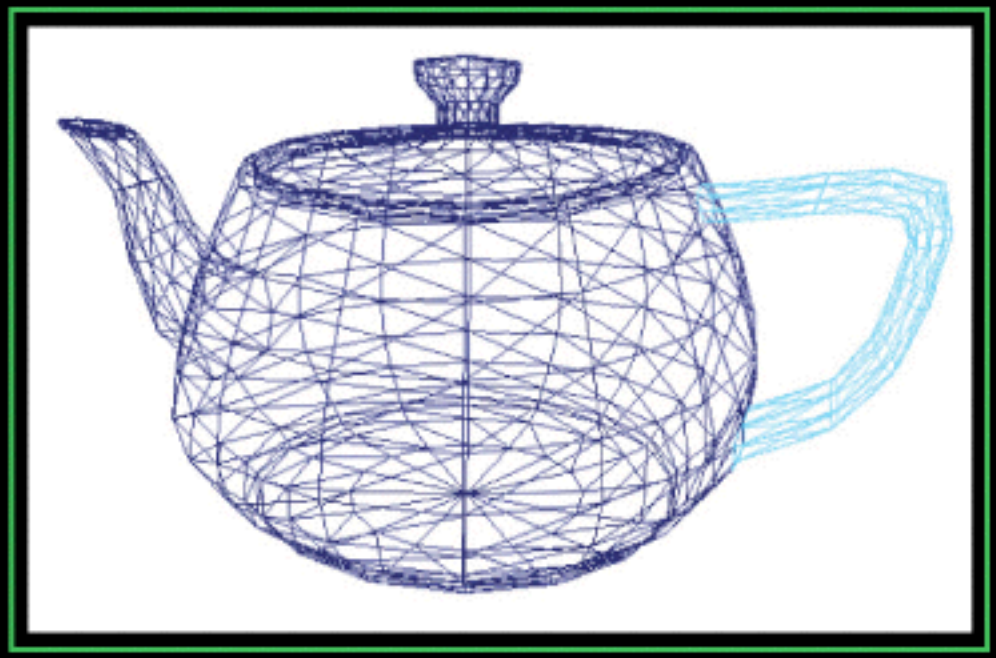


Step 4:

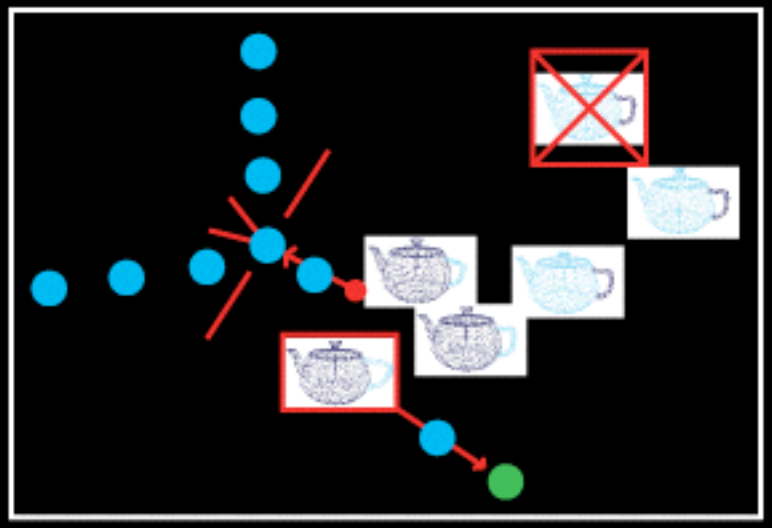
User determines which of the computer-generated iterations should be kept.

Arrow

10 new iterations were created!
Please review them:

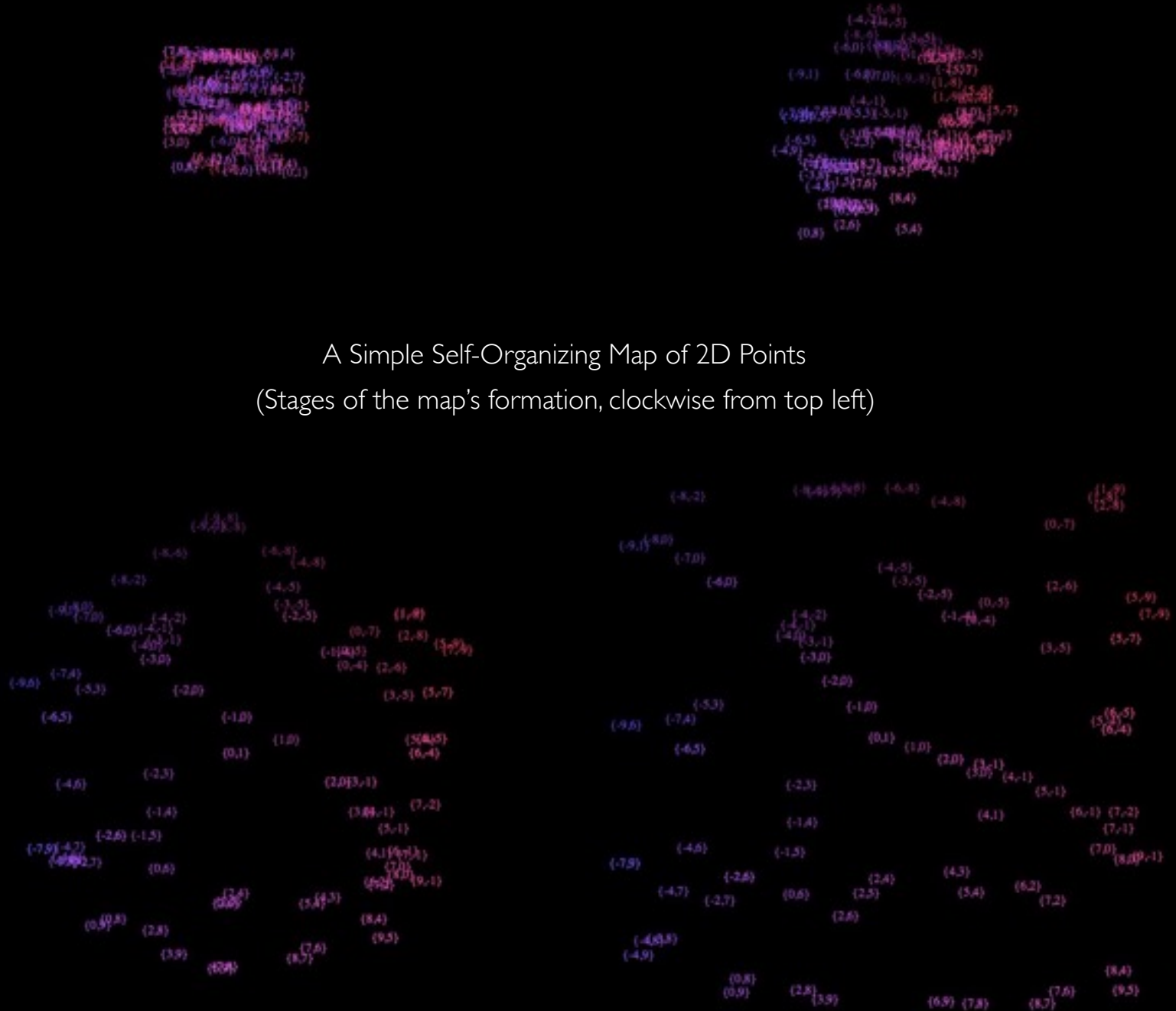


Keep | Delete



Repeat until a desirable design solution is found.

Appendix

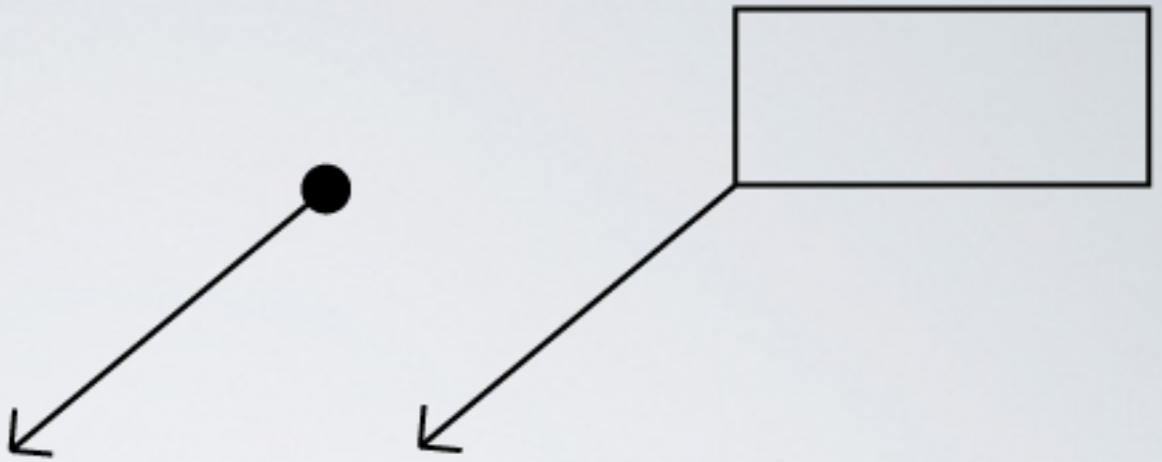


A Simple Self-Organizing Map of 2D Points

(Stages of the map's formation, clockwise from top left)

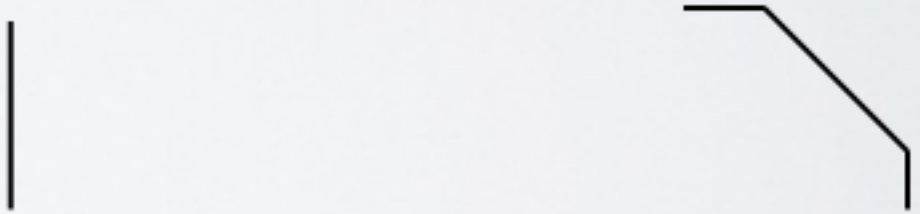
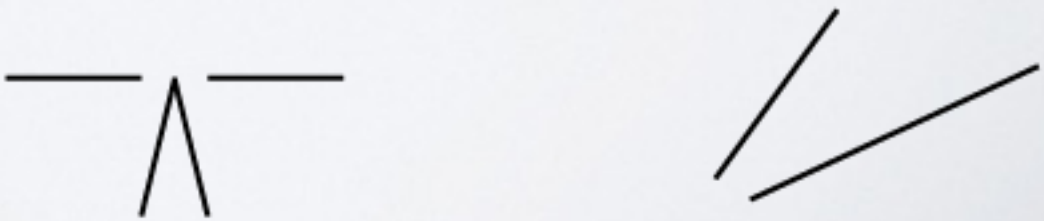
Arrow

Growth directives:



Wither directives:

Walls:



Gates and Funnels: