Principia Textilica:
Threads of Ancestry and Community

Project Documentation

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1 Principia Textilica

1.1 Context

In the course "Principia Textilica" we explored intersections of computational algorithms and textile craft, including pattern generation algorithms, weaving techniques, knot theory, hands-on experience with textile maschines, history lessons and more. For the final project each student was encouraged to find a subject to implement some of the methods and techniques we got to see during the course.

1.2 Motivation

I study Computer Science and Media, which means my background is more algorithmic/technical than art-related. Nevertheless I am familiar with a few textile techniques such as knotting (Macramé), weaving, sewing, felting and embroidery.
For inspiration I looked at two topics that have fascinated me for years: Modeling "Living" Things (plants/fungi/insects/animals) and complexity.
Complexity is often mistaken for complicatedness because the result looks complicated. However the system that produces a complex result is itself very simple. It consists of a certain number of elements and a few elemantary rules which are applied to those elements.
My goal was to use both, complexity and modeling simple "life", to create a (textile) pattern.

2 Implementation

2.1 Idea: The Pond/Fish tank

I decided to go with a swarm model, which means I have a number of individuals which are controlled by a set of rules concerning themselves, their dynamic environment (e.g.

the other members of the swarm) and their static environment (e.g. boundaries of the tank). The desired pattern would be generated by the movements of the individuals. I wanted to start with the rules and continuously adapt them depending on the outcome. The metaphor I chose was a school of fish moving around in a pond or glass tank.

2.2 Rules

The behaviour for each fish is mainly determined by four principles:
I Company - Each fish will follow other fish.
II Privacy - Each fish needs a minimum of private space.
III Security- Each (non-predatory) fish will avoid any predators.
IV Boundary- Each fish will stay inside the tank.

I implemented a single swarm simulation very similar to the "Boids"-idea. The simulation is in 2D and has 2 main elements: the tank and the fish. The tank started out as rectangular, but I found a circle to be more aesthetically pleasing (softer, more natural shape) as well as more fitting for an embroidery hoop. The circle embodies the simple inside/outside-world that I need. The tank restricts the movement of the fish inside. The fish swarm consists of individual fish that – exceptions are the color and the name – start out as equal clones. There are several more, but the most important fish parameters/properties are: - Size of field of view - Distance for avoiding other fish (Privacy) - Distance for following other fish (Company) - Speed for making turns Each fish can be either harmless or predatory towards other fish. There is no randomness in my program (again, except for the generation of colors). - If it is a predator or not.

2.3 Code Samples

2.4 Parameter Variation + Observations + Images

2.5 Unused Parameters

3 Textile Implementation

3.1 Preparation?

How I would translate that into something textile, I was not so sure at first, but I started with a thread-based idea, where each thread is seen as an individual. Macramé and Embroidery were favored candidates.

3.2

3.3 Finished Piece

4

5

5.1

Trial/Error runs? Unused parameters? References/inspiration/ideas: - Boids (Flocking simulation) - Pattern Generation - Changing Pattern in something fix First (implemented) sketched out idea: School of fish in a tank/pond, 2D to reduce scope of work: - Boids – idea for behaviour: seek companionship, avoid predators, walls and companions that get too close (company, safety, privacy) - (explain some parameters to finetune behaviour, also predators no real danger, like the problems we run from – they won't kill us, but starve us emotionally) - (explain main mechanism: finding the direction vector in each step, no randomness involved) - Other alterations/ playing with ideas: start with one fish that can spawn children (keep on moving or die after spawning)

Intermediate result: - Tracking positions in pixels : image with traces on picture (pixels, not lines) - Image with connecting lines (data = lines)

Role of Textiles in this? - Threads/knots as small part with defined behaviour (1. idea) - Errors over time, two tanks with same starting population grow apart (2. Idea, did not quite work, funny because with handcraft that happens : no identical pieces) - Connections to ancestors (3. Idea, without predators) - Connections to ancestors should limit the "life" of the fish somehow (3. idea) : threads also limited, no infinite resource in real life, limited freedom? - -¿ include death somehow? Maybe the thread becomes limited depending on how close you were when your ancestor died : shorter thread? - New connections to fish you are close to for a longer time : frienships/partnerships (different color/weight?) Textile finished piece: - Embroidery: pixelated image to threaded image (boring) - Connections to threaded image(series) (better? Development of generations) - Tree (knots/perls? = fish, length of edge is also determined by fish-bowl-movement) / graph : flexible TODO: startled spreads with a delay ("reaction time")

Code