

Splinoids project outline

GODIN-DUBOIS Kevin

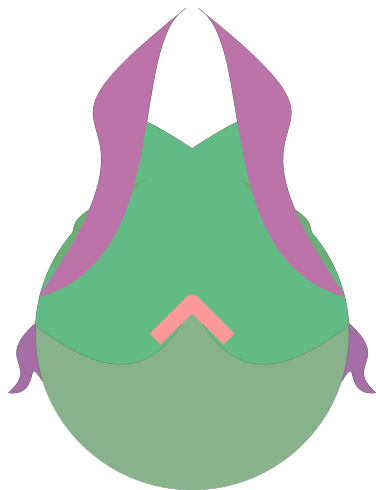
April 6, 2020

Generated on April 6, 2020

Perma-link: [kgd-al@github](https://github.com/kgd-al)

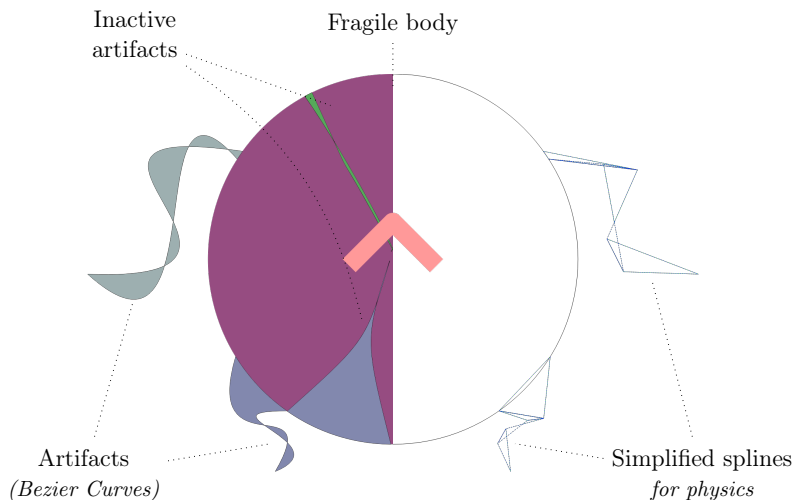
Splinooids

Spline + Boids



- 2D creatures
- Low-level combat
- Low-level vision
- Growth
- Autonomous reproduction
- Sexual dimorphism

Anatomy

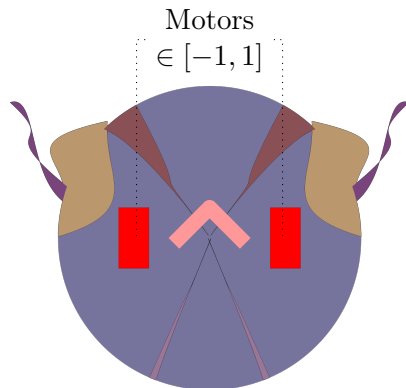


Combat

- Based on physical collision of primitives
- Both creatures receive damage¹
- Artifacts are denser and more resilient than the body
- Health regenerates but is costly

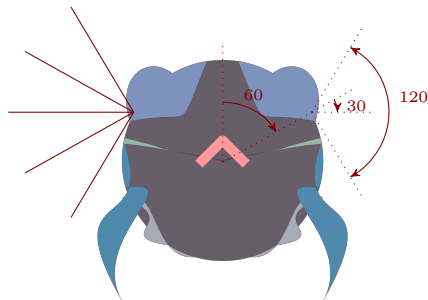
¹Unlike [2]

Motion

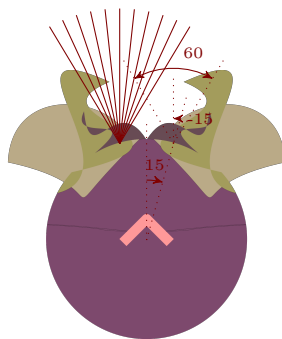


Tank-like behavior:
 $\{ 1, 1 \} \rightarrow$ Forward
 $\{ -1, -1 \} \rightarrow$ Backward
 $\{ -1, 1 \} \rightarrow$ Rotation
 $\{ 1, -1 \} \rightarrow$ Rotation

Vision



"Prey"



"Predator"

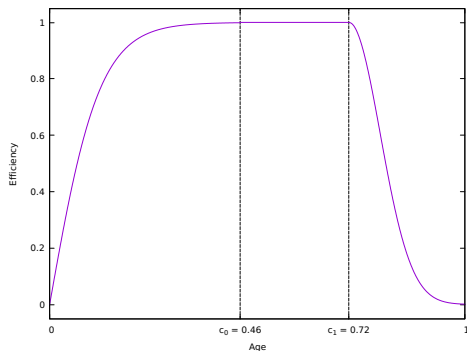
Parameterized by number of rays and angles

Audition

Not implemented

- Similar approach to [1]
- Multiple emission channels (neural-controlled)
- As many reception
- Hearing range managed by physics engine
- Signal intensity = strength / distance²

Life-Cycle



Age conditions life-step:

- $[0, c_0]$ youth
- $[c_0, c_1]$ maturity
- $[c_1, 1]$ old age

Life-Cycle

Youth



- Progressive growth of body size and artifacts
- Initial states are highly vulnerable

Life-Cycle

Maturity

- Reproductive behavior
- Based on energy accumulation²
- ANN-controlled decision
- Not yet implemented

²as in [3]

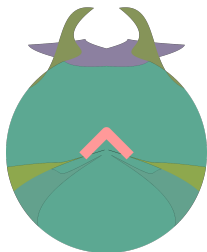
Life-Cycle

Senescence

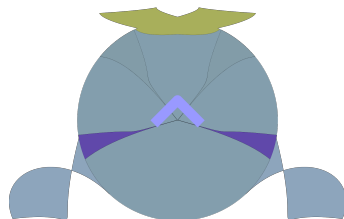
Reduction of maximal speed

> increased chance of starvation and being preyed upon

Sexual dimorphism



Female



Male

Identical genotype (except gender)
→ different phenotypes (shapes and colors)

Metabolism

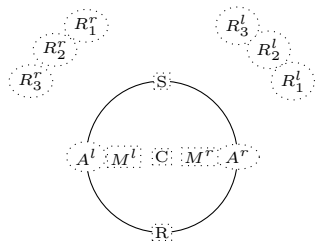
- Energy extracted from plants or corpses
- Baseline life cost
- Consumed energy returned to the environment

Metabolism

Clock speed

- ANN-controlled value
- Genetically controlled bounds
- Impacts:
 - Motion speed
 - Resource absorption
 - Resource consumption
 - Regeneration

Neural controller

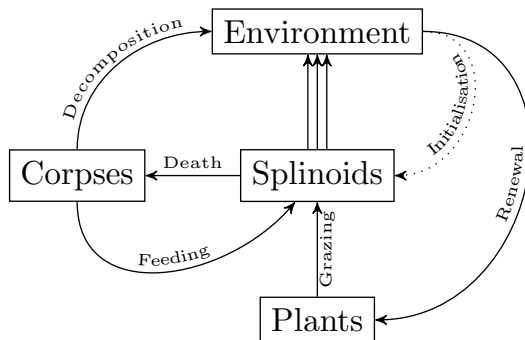


Inputs
R_i^s : retina cell triplet (r,g,b) i on side s
A^s : auditive cells (equal to number of channels)
—: proprioceptors (health, energy, efficiency)
Outputs
M^s : motor
C : Clock speed
R : Reproduction
S : Multi-channel signal

Most nodes are geometrical \rightarrow HyperNeat?

Environment

Environment



Closed system with constant total energy level

Environment

Potential genetic variables:

- Size
- Taurus (bool)
- Obstacles (distribution)
- Plants (distribution)

Extensions

Extensions

- Asymmetrical offspring investment
 - Emergence of sexual specialisation?
- Day/night cycle
 - Darkening of colors
 - Emergence of night-vision?

- References



David Kadish, Sebastian Risi, and Laura Beloff. “An artificial life approach to studying niche differentiation in soundscape ecology”. In: *The 2019 Conference on Artificial Life*. Cambridge, MA: MIT Press, 2019, pp. 52–59.



Thomas Miconi. “Evosphere: Evolutionary dynamics in a population of fighting virtual creatures”. In: *2008 IEEE Congress on Evolutionary Computation (IEEE World Congress on Computational Intelligence)*. IEEE, June 2008, pp. 3066–3073.



Peter Paul Pichler and Lola Cañamero. “Evolving morphological and behavioral diversity without predefined behavior primitives”. In: *Artificial Life XI: Proceedings of the 11th International Conference on the Simulation and Synthesis of Living Systems, ALIFE 2008* (2008), pp. 474–481.