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ReVa

Splinoids project outline

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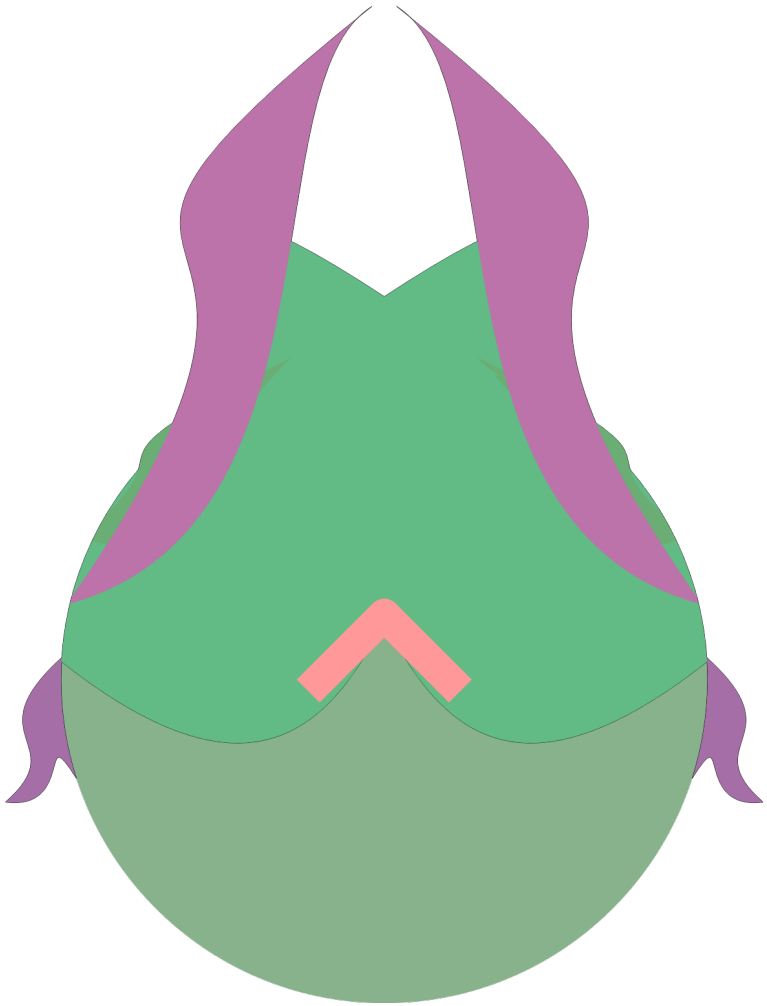
Perma-link: kgd-al@github

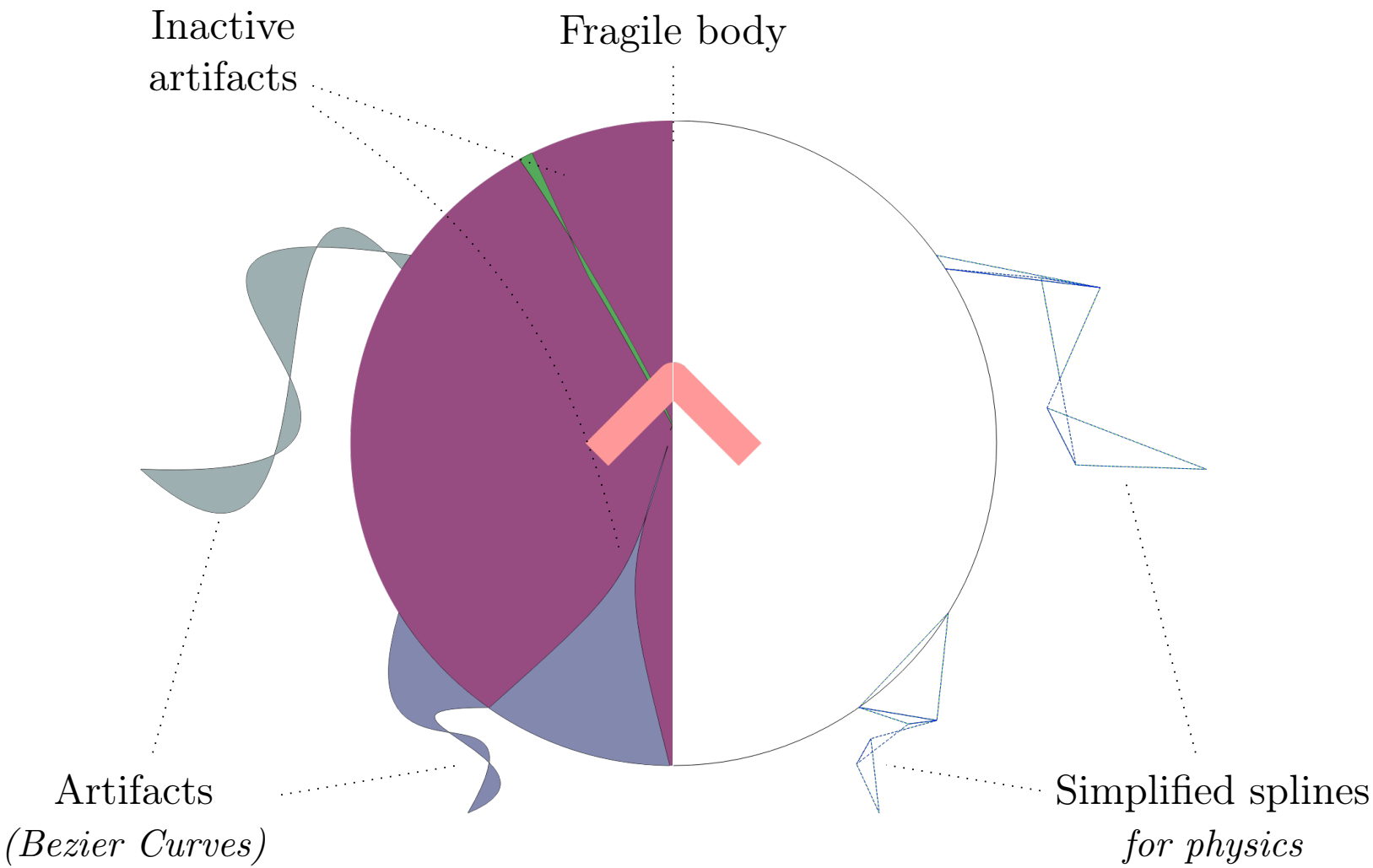
Splinoids

Spline + Boids



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

Anatomy

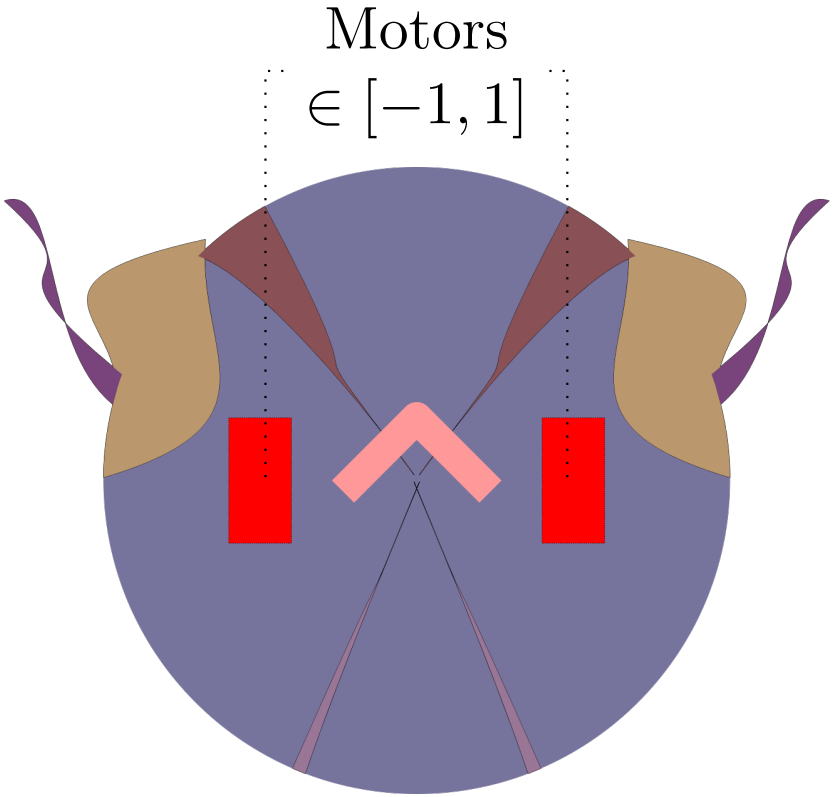

Inactive
artifacts
Fragile body
Artifacts
(Bezier Curves)
Simplified splines
for physics

Combat

- Based on physical collision of primitives
- Both creatures receive damage[1]
- Artifacts are denser and more resilient than the body
- Health regenerates but is costly

[1] Unlike [2]

Motion



Tank-like behavior:

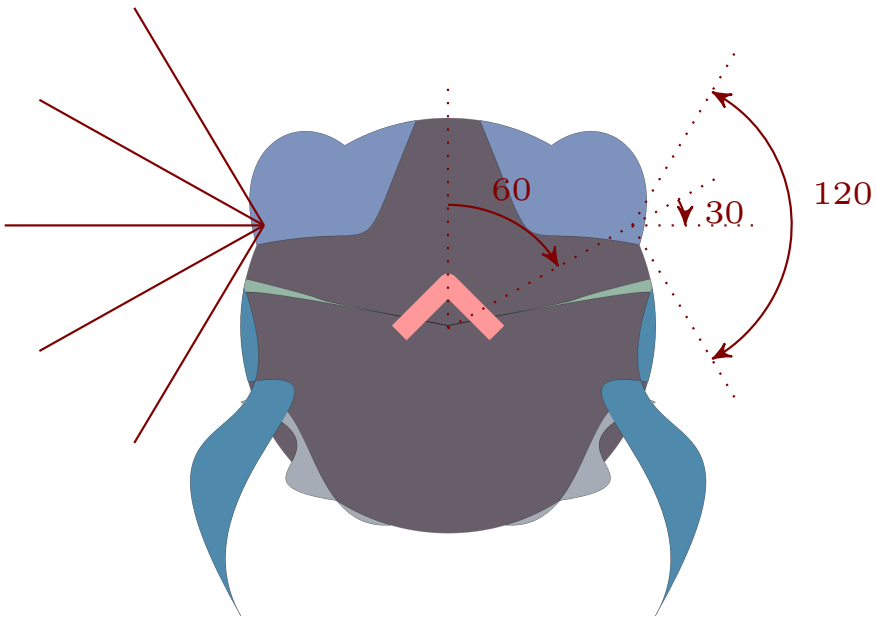
$\{\ 1,\ 1\} \rightarrow$ Foward

$\{\text{-}1,\text{-}1\} \rightarrow$ Backward

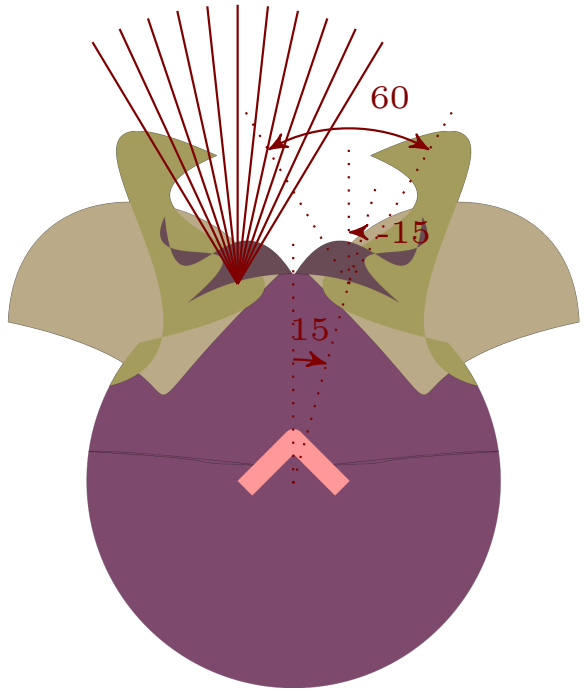
$\{\text{-}1,\ 1\} \rightarrow$ Rotation

$\{\ 1,\text{-}1\} \rightarrow$ Rotation

Vision



"Prey"



"Predator"

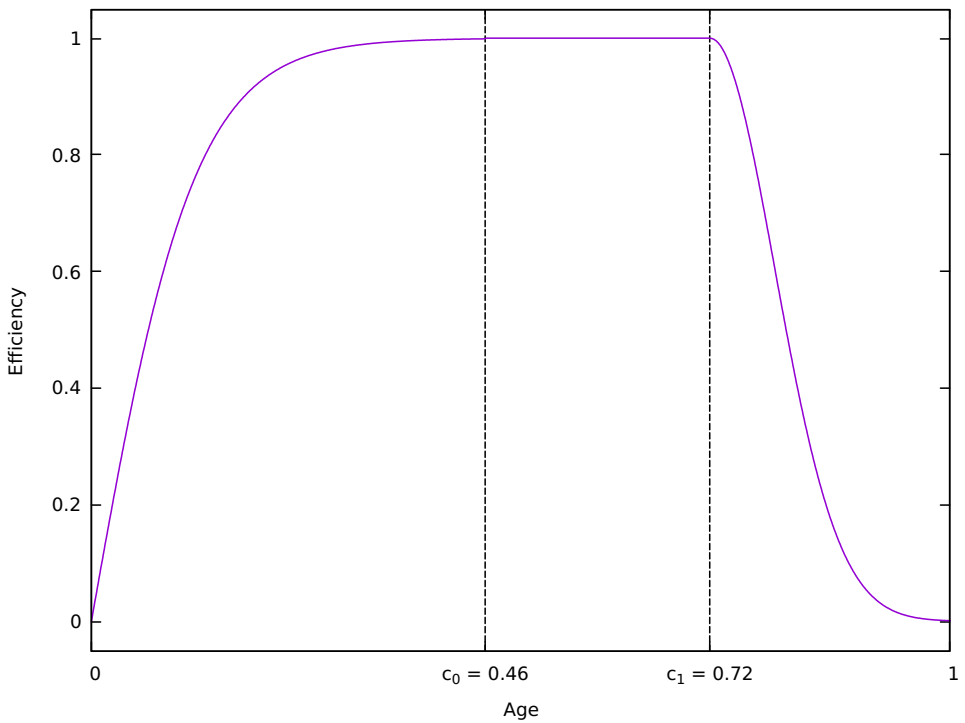
Parameterized by number of rays and angles

Audition

Not implemented

- Similar approach to [1]
- Multiple emission channels (neural-controlled)
- As many reception
- Hearing range managed by physics engine
- Signal intensity = strength / distance^2

Life-Cycle



Age conditions life-step:

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

Life-Cycle

Youth

step 0
eff. 0.0%

step 1
eff. 25.0%

step 2
eff. 50.0%

step 3
eff. 75.0%

step 4
eff. 100.0%

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

Life-Cycle

Maturity

- Reproductive behavior
- Based on energy accumulation[2]
- ANN-controlled decision
- Not yet implemented

[2] as in [3]

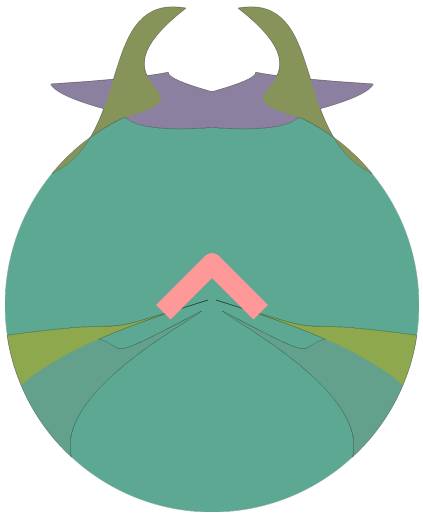
Life-Cycle

Senescence

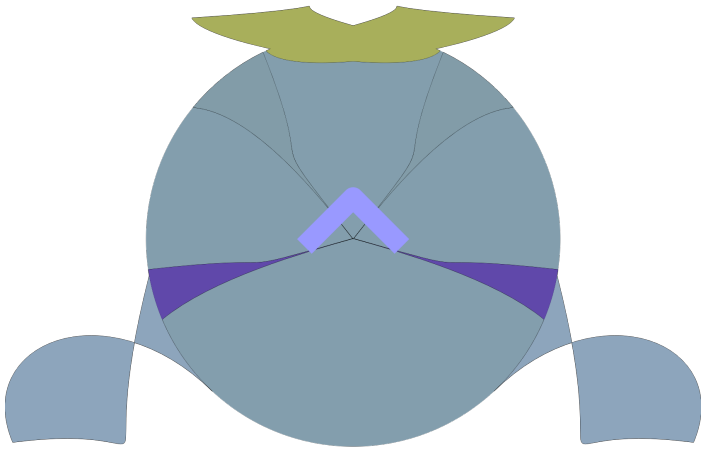
Reduction of maximal speed

$>$ increased chance of starvation and being preyed upon

Sexual dimorphism



Female



Male

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

Metabolism

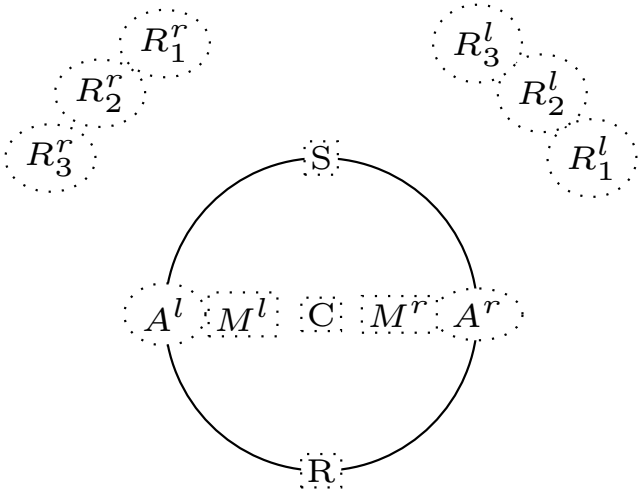
- Energy extracted from plants or corpses
- Baseline life cost
- Consumed energy returned to the environment

Metabolism

Clock speed

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

Neural controller



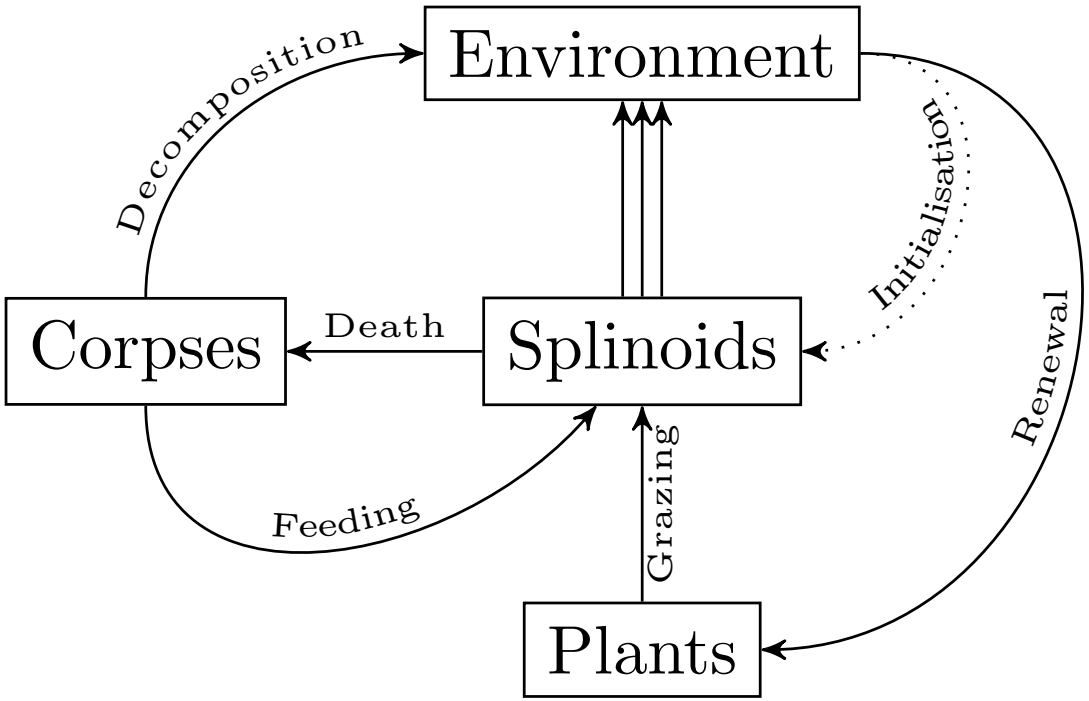
Inputs	
R_i^s:	retina cell triplet (r,g,b) i on side s
A^s:	auditive cells (equal to number of channels)
$-$:	proprioceptors (health, energy, efficiency)

Outputs	
M^s:	motor
C:	Clock speed
R:	Reproduction
S:	Multi-channel signal

Most nodes are geometrical → HyperNeat?

Environment

Environment



Closed system with constant total energy level

Environment

Potential genetic variables:

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

Extensions

Extensions

- Asymetrical 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 diversitywithout 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.