Evolution Simulator V1

Energy

All creatures require energy to survive. A creature's primary objective is to sustain energy - and thus sustain life.

Measuring Energy

In game units of energy can be measured by a (real or fictional) unit, such as Joules: TBD.

Stored energy capacity

- defining the max units of energy that can be stored by a creature
- example — [x x x x x o o o o o] creature has an energy capacity of 10 units, 5 units of stored energy

Metabolic rate

- work [W] - the concept of energy/time, e.g. joules/minute
- this is different for each creature, and different for each action (or inaction) performed by the creature

Using Energy

Energy is used by a variety of actions. Actions can only be performed when there is sufficient energy to do so:

resting metabolism (should be the majority of energy spend)

- simply existing requires energy, depending on the resting metabolism of the creature

movement (should cost a minimal amount)

- 1 energy per unit

procreation

- *see* procreation

Conserving/ Restoring Energy

Energy can be conserved/restored by:

eating food

- consuming food restores N units of energy

Running out of Energy

When a creature's energy is fully depleted, it dies.

At the time of death, its mass is translated to units of energy that become available to other creatures.

Environment

Creatures must navigate their environment to forage for food and survive. To start off, the environment consists of a few simple constructs: obstacles and food.

Map

The map is an M x N grid ,where each unit on the grid can accommodate either an obstacle, creature, or food.
Q: Should the map wrap around?

Obstacles

Barriers that block creature movement and line of sight. These can be generated randomly at game initialization using Perlin noise, or manipulated by the player directly.

- Water - can’t move through but can see through
- Rocks - can’t move through and can't see through

movement

- creatures cannot go through obstacles

sight

- cannot see creatures/food behind an obstacle.

Food

location

- food is randomly distributed across the map

variation

- all food yields X units of energy

spawn rate

- this is a parameter that can be tuned to control how many units of food energy spawn on the map per unit time

Future State

- **location**
  - certain areas on the map are initialized as “food hot spots”. These areas have a higher probability of generating food than others
- **variation**
  - different types of food can restore different amounts of energy
  - example
    - small food: 1 unit of energy
    - big food: 5 units of energy
- **spawn rate**

    - this is a parameter that can be tuned to control how many units of food energy spawn on the map per unit time
    - it may be interesting to experiment with variation + spawn rate. what evolves when 10 units of big food are generated per hour? what evolves when 50 units of small food are generated per hour?

Creature Stats

age

- How long a creature has lived
- A creatures efficient use of energy will decrease over time (in future state)
- age is defined as (current time - time born) / game day unit

energy

- max amount of stored energy
- If a creature has no more energy, it will die

sight

- field of view
    - 360
- distance
    - how far around can it see

speed

- How fast it moves per unit (1 is very slow, 10 is very fast)

Procreation Tendency

- Amount energy threshold for procreation

Procreation

- They can only breed once they've reached maturity
    - not sure how the specific maturity day should be calculated but can be set to 3 days for now
    - This prevents creatures from mating right away making very strange interactions if the baby and the parent both have enough to energy
- Creature with enough energy may ask another creature if they want to breed
- The creature will then respond either yes or no

    - both creatures will move towards each other

Creature Display

- Stats
    - Age
    - Energy and current energy
    - sight
    - Speed
    - current action