DARWIN SQUARES.
The game without players

Credits:
  kornelf (me): wrote all the code
  fefe: artwork and logo
  Mario Alexander: composed music for the game

What is this?
  This is a zero player game made for the PROCJAM 2024
  This is a multicellural ecosystem simulator, like an experiment. Shows the process of evolution and natural selection.

How it's made?
  This game is made by me (kornelf) in a week, and the music is made by Mario Alexander, the artwork by fefe.
  I used plain JavaScript (canvas drawing) to make this. All assets and code are made on the jam.
  It's open source: https://github.com/Kornelf4/darwin-squares

How it WORKS?
  Good question. I'll try to explain.

  On the surface of a sphere are separate systems, each with its own set of rules. In what follows I will call them organisms.
  I will later call the organisms' systems of rules behaviour or brains.

  So what does an organism consist of?
    Brain: it determines the behaviour of the organism. More on this later.
    Cells: the parts or organs of the organism. They perform functions depending on their type.
    Energy: used for movement and other actions.

  Life cycle of an organism:
    After the first generation, organisms arise from the reproductive cells of other organisms.
    Initially, they consist of only one nucleus and have a high energy content.
    The cell nuclei start to build the organism according to the inherited plan.
    If they accumulate enough energy, they can produce offspring and pass on their genes (behaviour + structure).

  Cell types:
    Primary:
      Cell nucleus: storage of genetic information, if destroyed, so is the organism
        out: 1
        in: anything (irrelevant)
      Green colored body: slowly but surely producing energy for the organism. In the evening, not effective
        out: time of day between 0 and 1. 0 is evening, 1 is day
        in: anything (irrelevant)
      Reproduction: reproductive organ of the organism. Without it, the organism dies out. Requires energy
        out: 0
        in: The organism always leaves offspring if it can, so irrelevant
      Membrane: the organism's organ of nutrition. It can take up nutrients (small green squares) to obtain energy
        out: 1.
        in: anything (irrelevant)

Whip: organ of locomotion of the organism. If there are more of them, the organism moves towards the sum of the movement vectors. It uses little energy and requires a signal.

    out: 0

    in: target speed

Secondary:

    Digestive eater: eats nearby cells of other organisms on contact. It then produces significant energy for the organism. Requires signal.

        out: 0

        in: Does it destroy other cells (if it can) 1: yes, 0: no

    Adder: logic cell. It adds up the incoming signals and takes its value.

        out: sum of inputs

        in: anything, can be more than one

    Cell sensor (Eye): one-way cell. Takes the distance of the nearest cell in one direction, from 0 to 1. Range of view 10 cells

        out: the distance of the nearest cell in a given direction, 0 to 1. 0 directly in front of the cell, 1 out of line of sight

        in: anything (irrelevant)

    Not: logical cell. It inverts the rounded incoming signals and takes the value. For example, if 1 is received, it takes a value of 0.

        out: For example, if 1 is received, it takes a value of 0

        in: anything

    Plant sensor (eye): similar to the cell sensor, except that it does not detect cells, but the plant nutrion.

        out: the distance of the nearest nutrient in the given direction, between 0 and 1. 0 directly in front of the cell, 1 out of sight

        in: anything (irrelevant)

    Random: logical cell. 0 and 1 take a random value manually.

        out: random value between 0 and 1

        in: anything (irrelevant)

How the brain works:

This is a simplified model, if you want to know more, write me on discord or check out the code on github :P

The brain consists of nodes that interact with each other and with the cells of the organism.

Brain nodes are structured, their connections are inherited

Let's take an example. We have a four-cell organism like this:

A whip cell, a membrane, a nucleus, a 'not' cell, a green colored body.

The value of the green colour body is read by the 'not' cell and its value is read by the 'whip' cell.

In other words, during the day the green body takes on a value of 1 and the 'not' body takes on a value of 0. When the whip takes up 0 coins, it is not moving and consumes no energy.

In the evening, it is the other way round. In the evening the organism cannot photosynthesise, but it is moving and gathering nutrients.

It's a fairly viable organism, so it stays alive and inherits its behavioral structure. It would pass on if it had a reproductive cell, but without one the organism dies out :(

Mutations:

Sources of biological diversity. And no, they will not grow tentacles.

Small changes can occur in the genes of any new organism, both in behaviour and structure.

If the change is beneficial, the organism will survive

Control:

WASD to move the camera, + to zoom in and - to zoom out

Settings:

Graphics: you can speed up longer simulations by turning off graphics

Culling: in less balanced simulations, to prevent overcrowding, you can set a max organism count and nutrient count

Organism mutation chance: determines the chance that the genes of an organism will mutate during reproduction

Cell mutation chance: determines the chance that each cell in the organism will mutate

Growing energy cost: determines not only the energy cost of each cell, but also the survival difficulty of the organism

Size of world: determines how long the sides of the game area are in cells

This project is under intensive development. Updates soon.
If you don't understand something, you find a bug or just interested: you can write me on discord (kornel.fab)

(I just realized documentaton writing is actually harder than coding)