

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 multicellular ecosystem simulator, maybe an experiment. Shows the signals 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.
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 the 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 times. 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. Vomits 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 then 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 nut.

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)