Excercise 1.
Implementing a first Application in RePast: A Rabbits Grass Simulation.

Group №10: Louis Faucon, Alexis Jacq

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1 Implementation

1.1 Assumptions

At each step a fixed number of pieces of grass grow on random cells, with the possibility to accumulate (without limit) several pieces of grass on each cell. When a rabbit is on a cell, he eats the all the grass of the cell.

1.2 Implementation Remarks

The parameters of our simulation are

```
GrassGrowth = 20
NumAgents = 20
RabbitStomach = 20
GrassGrowth = 20
WorldXSize = 20
WorldYSIze = 20
```

We use the same parameter t (`RabbitStomach`) to decide how rabbits die and reproduce.

- Rabbits are born with between t and $2 * t$ energy
- Rabbits lose 1 energy at each step
- Rabbits gain 1 energy for each grass eaten
- Rabbits die if they reach 0 energy
- Rabbits make a baby if they have more than $2 * t$ energy and lose t energy

We implemented a slowdown parameter that allow to play the simulation slowly
We implemented a visualisation of two measures: average grass per cell and rabbit per grass growth

2 Results

2.1 Experiment 1

2.1.1 Setting

```
GrassGrowth = 20
```

```
NumAgents = 20
RabbitStomach = 20
WorldXSize = 20
WorldYSIze = 20
```

2.1.2 Observations

We observe the that the quantity of rabbits oscillates around the value 20 and that the quantity of grass has an opposite oscillation because, if less rabbit eat the grass, there is more room to grow. We remark that in our implementation a growth rate of X can sustain a population of X.

2.2 Experiment 2

2.2.1 Setting

```
GrassGrowth = 20
NumAgents = 1
RabbitStomach = 1000
WorldXSize = 20
WorldYSIze = 20
```

2.2.2 Observations

In that case the population of rabbit is much more stable. It first grows to reach a population of 20 rabbits, then stays at his value (more or less).

2.3 Experiment 3

2.3.1 Setting

```
GrassGrowth = 40
NumAgents = 100
RabbitStomach = 5
WorldXSize = 20
WorldYSIze = 20
```

2.3.2 Observations

In that situation the population of rabbit is less stable and we observe bigger changes due to the easier reproduction and dying rates.

2.4 Experiment 4

2.4.1 Setting

```
GrassGrowth = 75
NumAgents = 75
RabbitStomach = 75
WorldXSize = 10
WorldYSIze = 10
```

2.4.2 Observations

The world is covered by rabbits, be careful where you walk!

2.5 Experiment 5

2.5.1 Setting

```
GrassGrowth = 1
NumAgents = 2
RabbitStomach = 1000
WorldXSize = 3
WorldYSIze = 3
```

2.5.2 Observations

Bella and Oreo were living a very happy life together. Unfortunately the world was not producing enough grass for both of them to live like this forever. After about 3000 steps Bella died of hunger and Oreo went on living alone and sad (nearly) forever.