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Intelligent Agents: about Rabbit Simulation

The Code

Following the tutorial we implemented the following files.

Model

Over the required features, we implemented the bonus statistics graph.
This graph takes:

a. the size of the agents list, to know how many agents are currently alive.
b. a newly implemented counter which tracks the amount of grass currently present on the whole field. Each time we add grass to a cell, our counter is incremented by this amount. And our agent eat methods return the grass amount that has just been eaten. As such, we can directly reduce the current grass amount by that value. This effectively avoid doing yet another for-loop on all the grid cells to sum the grass amounts.

Space

There are basically two spaces. One for the grass and one for the rabbits.
The ‘grass space’ keeps track of the amount of grass in each field and the ‘rabbit space’ keeps track of where all the rabbits are.
They are both used to display the actual world state besides providing information about the location of grass and rabbits.

Agent

The agent class describes a rabbit and all the methods that allow it to move, eat, reproduce and die.

Results

Initial number of rabbits

This parameter defines how many rabbits populate the world at the beginning of the simulation. If this parameter is set to zero then obviously no rabbit is created and the grass grows without limitation. On the other hand if it is set very high then many rabbits die in the first iterations because there is not enough grass for all (except the grass growth rate is set high enough).

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Grass growth rate

The grass growth rate determines how many grass grows each turn.
It also acts as the limiting factor for the rabbit population. Meaning that if the rate is increased then the rabbit population will also increase. Similarly if the grow rate is decreased then the rabbit population will decrease.

Birth threshold

The birth threshold determines how much energy a rabbit must ‘have’ to reproduce.
The higher this threshold the longer it takes for a rabbit to reproduce (because it has to gather more energy) and less rabbits are born because some rabbits will die before reaching this threshold. This leads to a population that is slower to react to an increase of grass growth.
The population will also fluctuate less the higher this threshold is exactly because less rabbits are born all the time.