Introduction to Artificial Intelligence

Bachelor's in informatics Engineer and Informatics Engineer – European course

2º Year – 1º semester

Practical classes

Assignment 4: Adaptive Agents

Environment 1

In an environment defined by a two dimensional toroidal grid there are some agents. The main objective of each of these agents is to find food in order to ensure their survival.

In the environment there are two types of food: A, B. One of these type of food can increase the power of the agents, is essential for their survival. The other one is poisonous and their intake causes immediate death. At the beginning of each simulation, the model randomly chooses which the food is the good and which is the poison. The agents do not have access to this information.

Characteristics of agents:

- Perceptions: they can determine the contents of the cell immediately in front;
- Actions: they can move forward to the cell in front or rotate 90 degrees to the left;
- Memory: they have an internal variable, which stores their preference for food (type A or B). This preference is randomly determined when they are created and can be right or wrong (the agents do not know what the poisonous food).
- Agents automatically ingest the food of the current cell. If it is good, their energy increases (50 units). If it is poison, the agent dies.

The environment:

- The food automatically reappears in the environment, as agents are ingesting it.

Tasks

1. The *Netlogo* file ***IIA_Ficha4_Inicio.nlogo*** has an implementation of the model described above. Complete the procedure **move** with the defined behavior to be taken by each agent for the exploitation of the environment. Note that the agents do not have access to the variable poison (***veneno***), i.e., they do not know if the poisonous food is A or B. To decide what to do, can only appeal to the perception of the cell in front and your favorite internal variable which store what they believe is the good food;
2. Run the model, perform some simulations and analyze the results. Study the impact of ***perc_comida*** parameter (percentage of food in the environment) in the survival of agents. Use the EXCEL file **IIA_Ficha4_Results.xlsx** to register the values. Because of the random nature of the models, the same experiment must be repeated several times (e.g. 10-times) and analyze the average values;

3. Add the possibility of reproduction. In each iteration, each agent has 5% chance to reproduce (regardless of its energy). During reproduction, an agent creates a new agent with the same characteristics. The energy of the parent is divided equally between the two agents;
4. Repeat simulations and interpret any differences in the results. Use the EXCEL file **IIA_Ficha4_Results.xlsx** to register the values. Because of the random nature of the models, the same experiment must be repeated several times (e.g. 10-times) and analyze the average values.

Environment 2

In this environment the poisonous food will be changing regularly. To implement this feature, add the following function to the code:

```
to change_poison
  if random-float 1 < change_rate
  [
    ifelse poison = "A"
    [set poison "B"]
    [set poison "A"]
  ]
end
```

This function should be called at the end of the procedure *go*.

Tasks

1. Repeat simulations and interpret any differences in the results. Use the EXCEL file **IIA_Ficha4_Results.xlsx** to register the values. Because of the random nature of the models, the same experiment must be repeated several times (e.g. 10-times) and analyze the average values.

Additional simulations

1. Study the effect of the following parameters:
   - Population size;
   - Frequency of change of poison;
   - Food Percentage of the environment;
   - Reproduction of probability.

   Use the EXCEL file **IIA_Ficha4_Results.xlsx** to register the values.