Lab 4 - Intelligent Termites

NETLOGO

1. Introduccion

In this practical, we will change from StarLogo to NetLogo. They are both similar, but they are programmed with commands, rather than blocks. As an introduction to Netlogo, we will again work with ants. However, these will be more realistic than in the first practical.

According to the Wikipedia, pheromones are chemical substances, secreted by living beings with the purpose of provoking specific behaviours in other beings, often of the same species, but also they can be used against other species (e.g., some trees attract birds with their pheromones to defend themselves against some insects, and other insects use pheromones over their competitors to destabilize their metabolism). The pheromones behave like a mean to transmit signals, and their main advantages are the being able to reach over long distances and avoid obstacles, since they are dispersed by wind.

In this practical, you will have to implement a population of ants that group together through the use of pheromones.

2. Implementacion básica

You will generate a population of ants (with a variable quantity, controllable by means of a slider) and a world entirely clean, without any initial pheromone. To add pheromones in the world, you may use the command *patches-own*.

2.1. Ants

Every ant will behave in the following way:

- An ant will observe the patch ahead and the patch-left-and-ahead, and patch-right-and-ahead. Next it will focus along the direction that carrying more pheromones. In case there is a tie between two or more directions, the ant will select one of them randomly.
- Ants step ahead once at each iteration of the algorithm.
- At every time it arrives to a patch, the ant will leave two pheromones in it.

2.2. Pheromones

Pheromones also evolve during simulation, so that you will have to implement a certain behaviour. In particular, the rules of propagation of pheromones are:

- At each step, pheromones are dispersed 100% in the patches around (search the command *diffuse*, which you should use, with value 1)
- In case the pheromones dissipate a bit, reduce their value to a 90% of their previous one.

3. Pheromones

Once we have the simulation working with the other parameters explained above, we can proceed to change them to study the dynamics according to the same values.
In particular, the simulation must allow us to configure the following parameters (default values between parenthesis):

Population. Total number of ants that participate of the simulation (200)

Evaporation. Perceptage of evaporation of the pheromones (10).

Diffusion. Percentage of diffusion of pheromones (90).

Smell-range. Distance at which an ant can perceive the pheromones (1).

Obviously, if there is any other parameter you deem interesting, we will appreciate you including it.

4. Delivery

Deliver both your Netlogo project, as well as a small memory (in pdf please), describing your work. Your memory must include, minimally:
- An explanation of the implementation. Present your code in parts, indicating which functionalities or strategy of the specification they implement.
- Explain the experiments you have carried out with the different parameters available. You may include screenshots to facilitate your explanation.
- Analysis and conclusions of the experiments you carried out, indicating which values you think are better and why.
- Future work. Explain the ideas you came up with by observing the ants' behaviour. Do you have any technique to accomplish different behaviours aggregated by means of pheromones.

The deadline to deliver the practical is the 14th October 2019.

5. Evaluation

We will evaluate three aspects of your work:
1. A correct, clear specification that corresponds to the one described in this document.
2. The tests and analyses you performed and the conclusions you reached.
3. The quality of the memory.

4.

Una hormiga observara la casilla de delante (patch-ahead), diagonal delante-izquierda
(patch-left-and-ahead) y diagonal delante-derecha (patch-right-and-ahead). A continuaci
on se enfocara hacia la direccion que tenga mas feromonas. En caso de que haya
empate entre dos o mas direcciones, la hormiga seleccionara una de ellas aleatoriamente.
Las hormigas dan un paso adelante en cada iteracion del algoritmo.
Cada vez que llegue a una casilla, la hormiga deja dos feromonas en ella.
2.2. Feromonas

Las feromonas tambien evolucionan durante la simulacion, as que tendreis que implementar su \comportamiento". En concreto, las reglas de propagacion de las feromonas son:

En cada paso de simulacion, las feromonas se dispersan al 100% en las casillas de alrededor (buscad el comando diffuse, que debereis usar con valor 1).

En cada paso las feromonas se disipan un poco, reduciendo su valor a un 90% del anterior.

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3. Implementacion avanzada

Una vez tengamos funcionando la simulacion con los parametros indicados arriba, procederemos a permitir cambiarlos para estudiar la dinamica de las hormigas segun los valores de los mismos.

En concreto, la simulacion debe permitirnos congurar los parametros siguientes (entre parentesis el valor por defecto):

population. Numero total de hormigas que participan en la simulacion (200).

evaporation. Porcentaje de evaporacion de las feromonas (10).

diffusion. Porcentaje de difusion de las feromonas (90).

smell-range. Distancia a la que una hormiga huele las feromonas (1).

Obviamente, si creeis que hay algun otro posible parametro interesante se valorara que tambi en lo incluyais.

4. Entrega

Entregareis tanto el proyecto Netlogo como una peque~na memoria (en pdf por favor) describiendo vuestro trabajo. La memoria debe incluir, como mnimo:

Explicacion de la implementacion. Presentad vuestro codigo en partes, indicando que funcionalidad(es) o estrategia de la especicacion implementan.

Explicacion de los experimentos que habeis realizado con los distintos parametros disponibles. Podeis incluir capturas de pantalla para ayudar en vuestra explicacion.

Analisis y conclusiones de los experimentos que habeis realizado, indicando que valores os parecen mejores y por que.

Trabajo futuro. Explicad que ideas se os han ocurrido al observar el comportamiento de las hormigas. >Se os ocurre alguna tecnica para conseguir diferentes comportamientos agregados mediante feromonas?

La fecha de entrega es el 9 de Noviembre del 2017.

5. Evaluacion

Se evaluaran tres aspectos de vuestro trabajo:

1. Que la implementacion sea correcta, clara y corresponda a la especicacion indicada arriba.

2. Pruebas realizadas y analisis/conclusiones de las mismas.

3. Calidad de la memoria.