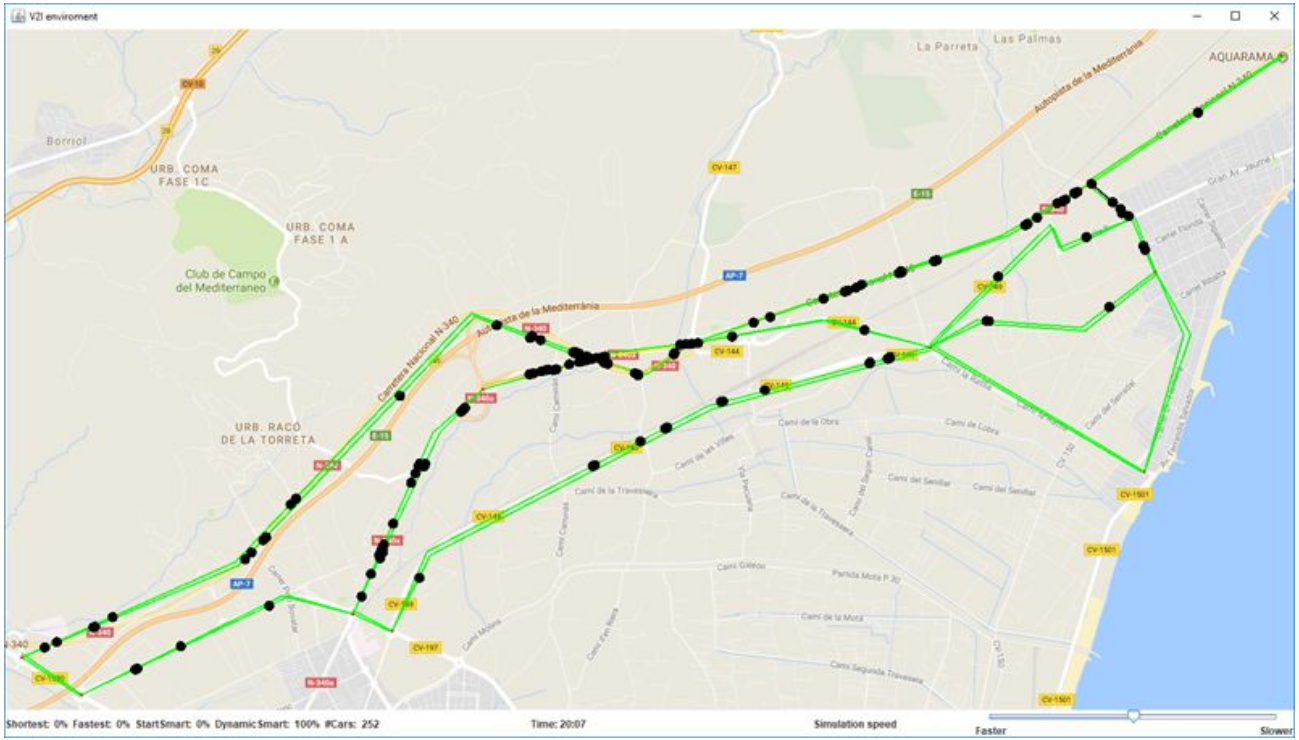
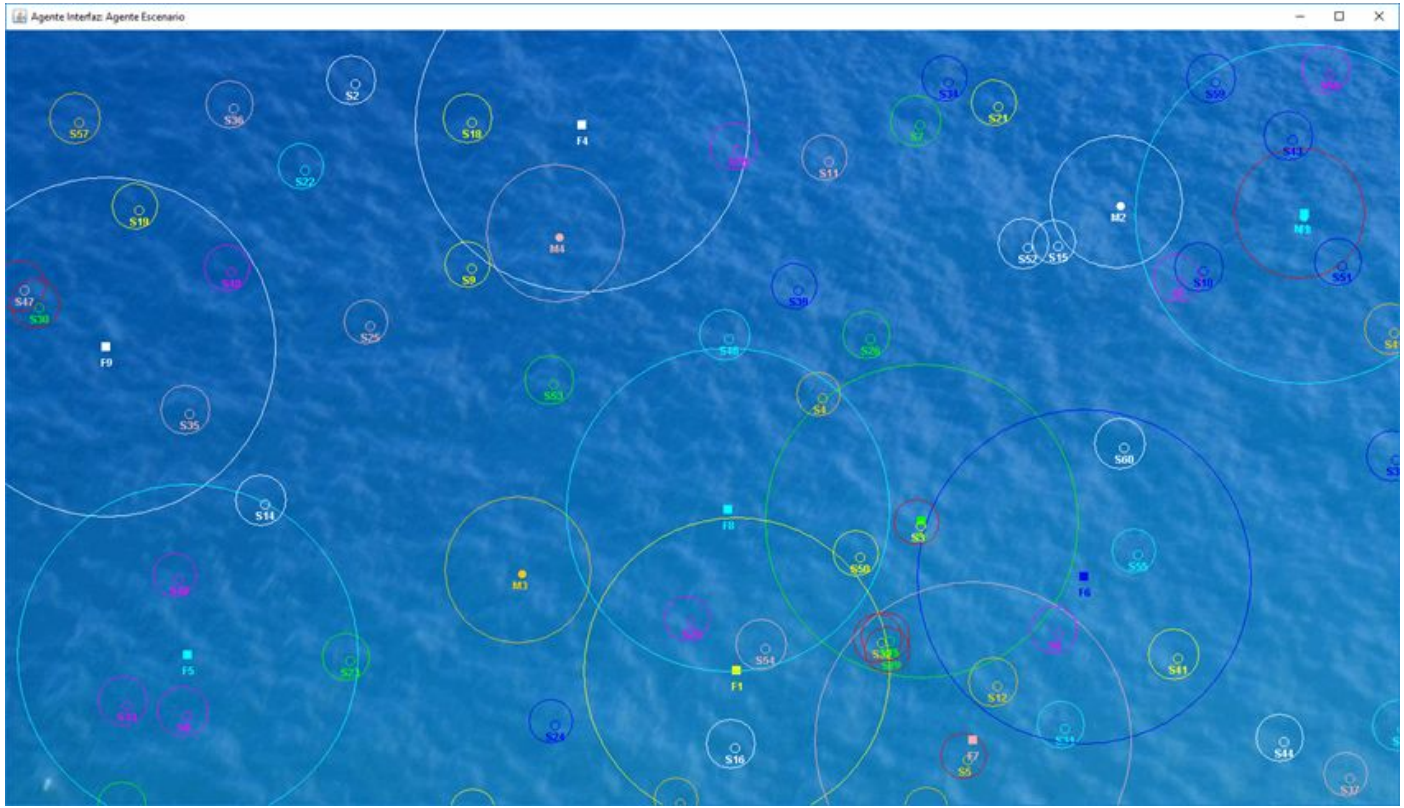
Computational Intelligence

Modeling, analysis, synthesis.

Self-interested and autonomous behaviours

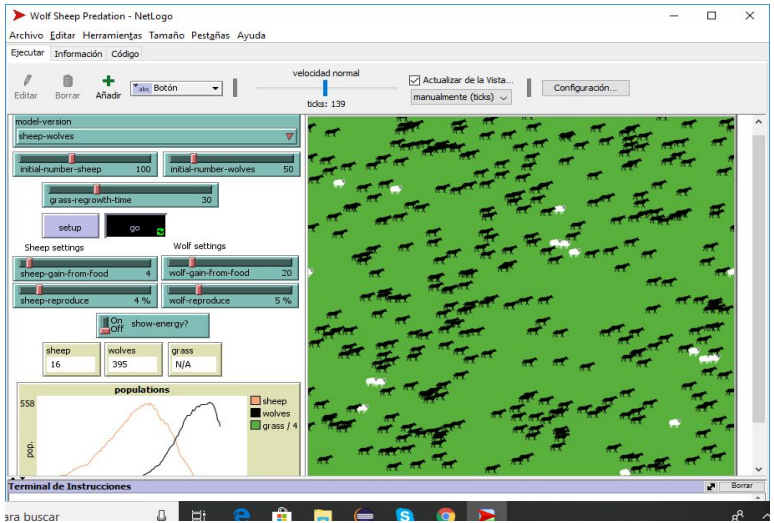


Solving tasks by cooperation



Coordinating actions

Why write models? Agents? Multiagents?

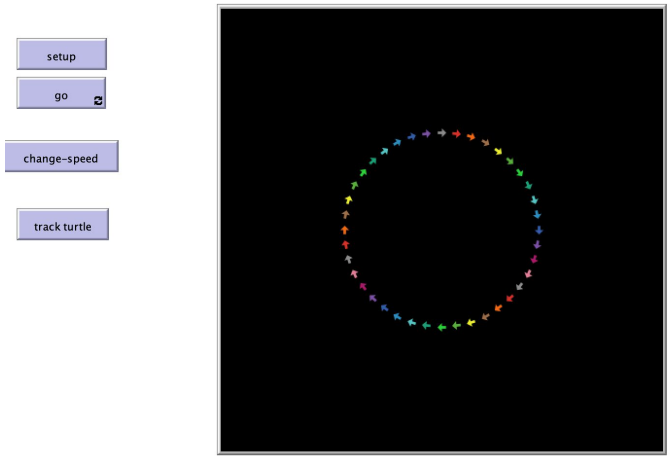


Differential equations of Lotka Volterra model the evolution of the hunters (y) and prey (x):

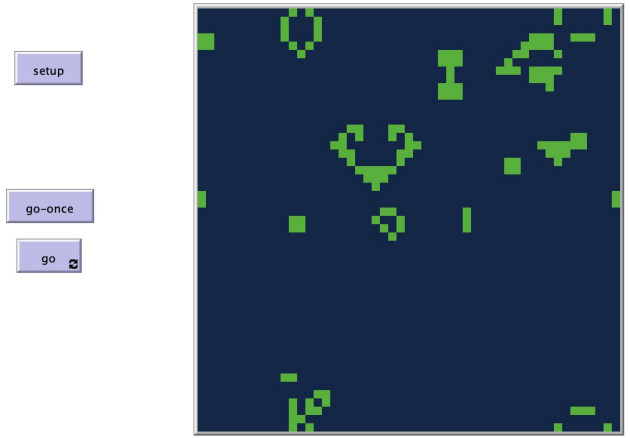
$$dx/dt = Bx-\beta xy$$

$$dy/dt = \delta xy-My$$

Synthesis, analyzing emergent behaviours



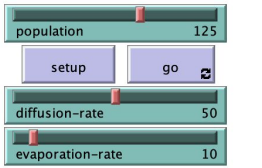
What will happen if the size of the step of each robot changes?

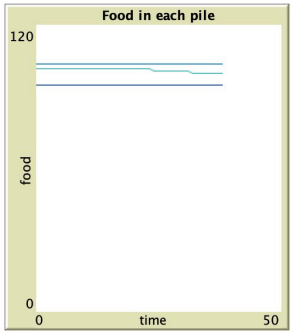


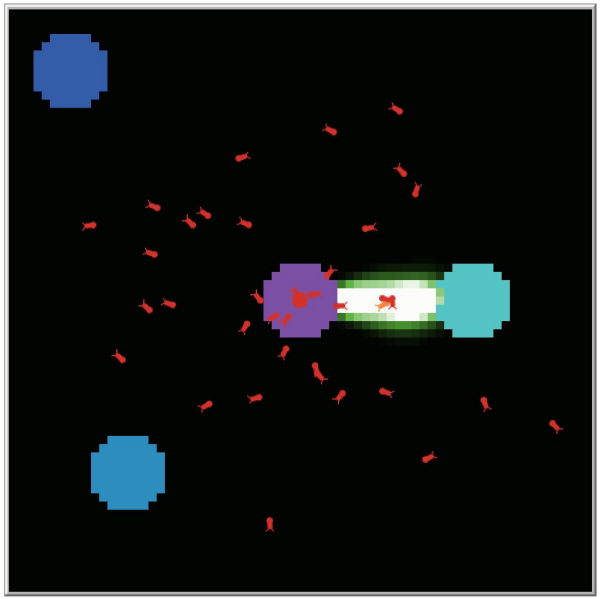
The game of life (rules)

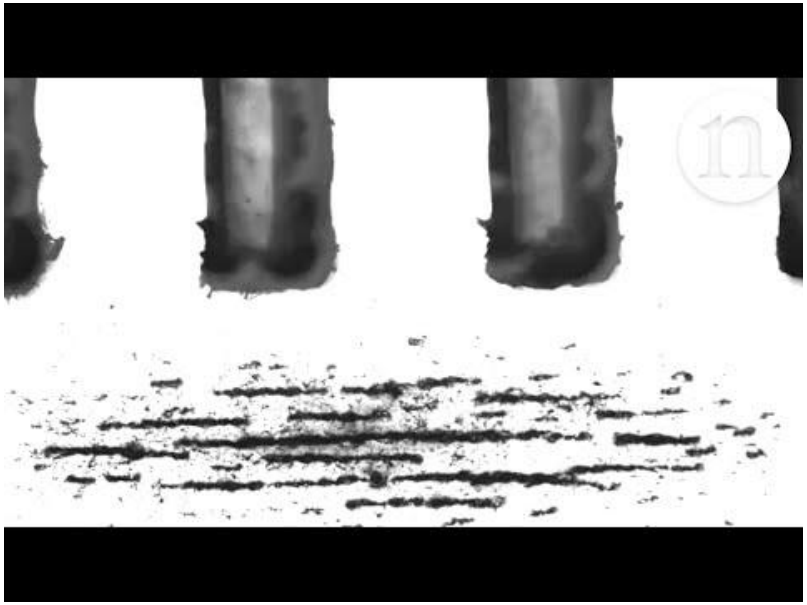
If there are 3 live behaviour cells, go live!
If there are 0 , 1 or more than 3 live behaviour cells, die!
If there are 2 live behaviour cells, stay the same.

More emergent behaviours









Subject structure (Location: TD1111AL Thursday/TD1110AL Friday)

(40% points) Theory classes:

- Explanation of theory concepts + exercises (evaluation).
- Netlogo development and analysis of models (evaluation).

(60% points) Computational solution of problems:

- 1 practice with Google colab and Reinforcement Learning.
- 2 practices modelling multiagent architectures with message passing in Netlogo.

Theory & Practice planification

Roughly 13 weeks.

- Unit 1: Modelling an intelligent agent.
- Unit 2: Agent societies.
- Unit 3: Interaction fundamentals.
- Unit 4: Cooperative agents.
- Unit 5: Self-interested agents.

Theory documentation

Slides from the aula virtual.

Netlogo home page (http://ccl.northwestern.edu/netlogo/)

Books:

– An introduction to Agent-Based Modelling. Uri Wilensky & William Rand. MIT press (2015).
– Fundamentals of Multiagent Systems. José M. Vidal (2010). (http://www.multiagent.com/fmas)
– An introduction to Multiagent Systems. Michael Wooldridge. John Wiley & sons (2009)
– Reinforcement learning. An introduction (2nd ed). Sutton and Barto. MIT press (2018)