

SpikeAnts, a spiking neuron network modelling the emergence of organization in a complex system

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Poster T99

NIPS 2010
December, 7th. 2010

Division of labor

Decision-making process for foraging behavior:

- Spatially distributed agents
- Asynchronous process (no supervisor)
- “0th intelligence” agent (no counting skill)

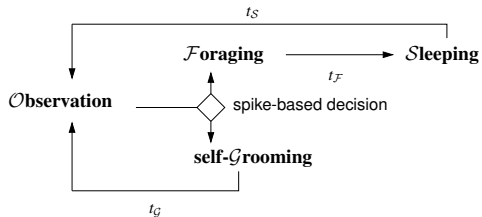


Proposition: A spiking neuron approach

Basic rule: An agent does not need to go foraging if there are sufficiently many other foraging agents.

- Local decision based on interaction dynamics
- Global spatio-temporal coupling between individuals

Division of labor in ant colonies

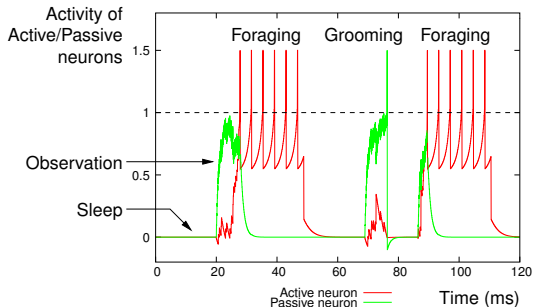


SpikeAnts

- 4 states
- 2 spiking neurons

At the individual level:

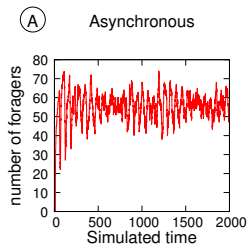
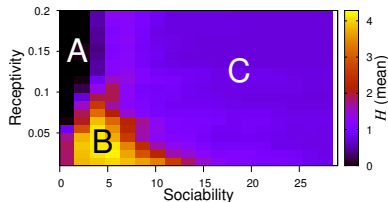
- Neuronal competition
- Decision based on first spike



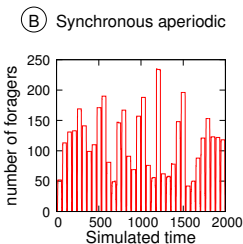
Spatio-temporal coupling at the population level

Two control parameters:
Sociability & Receptivity

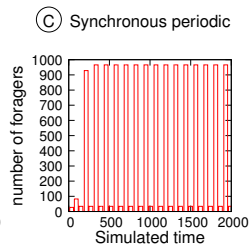
Phase diagram: Entropy regimes



Individualist
regime



Intermediate
regime



Day & night
shift