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

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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

Asynchronous

Synchronous aperiodic

Synchronous periodic

Individualist regime

Intermediate regime

Day & night shift