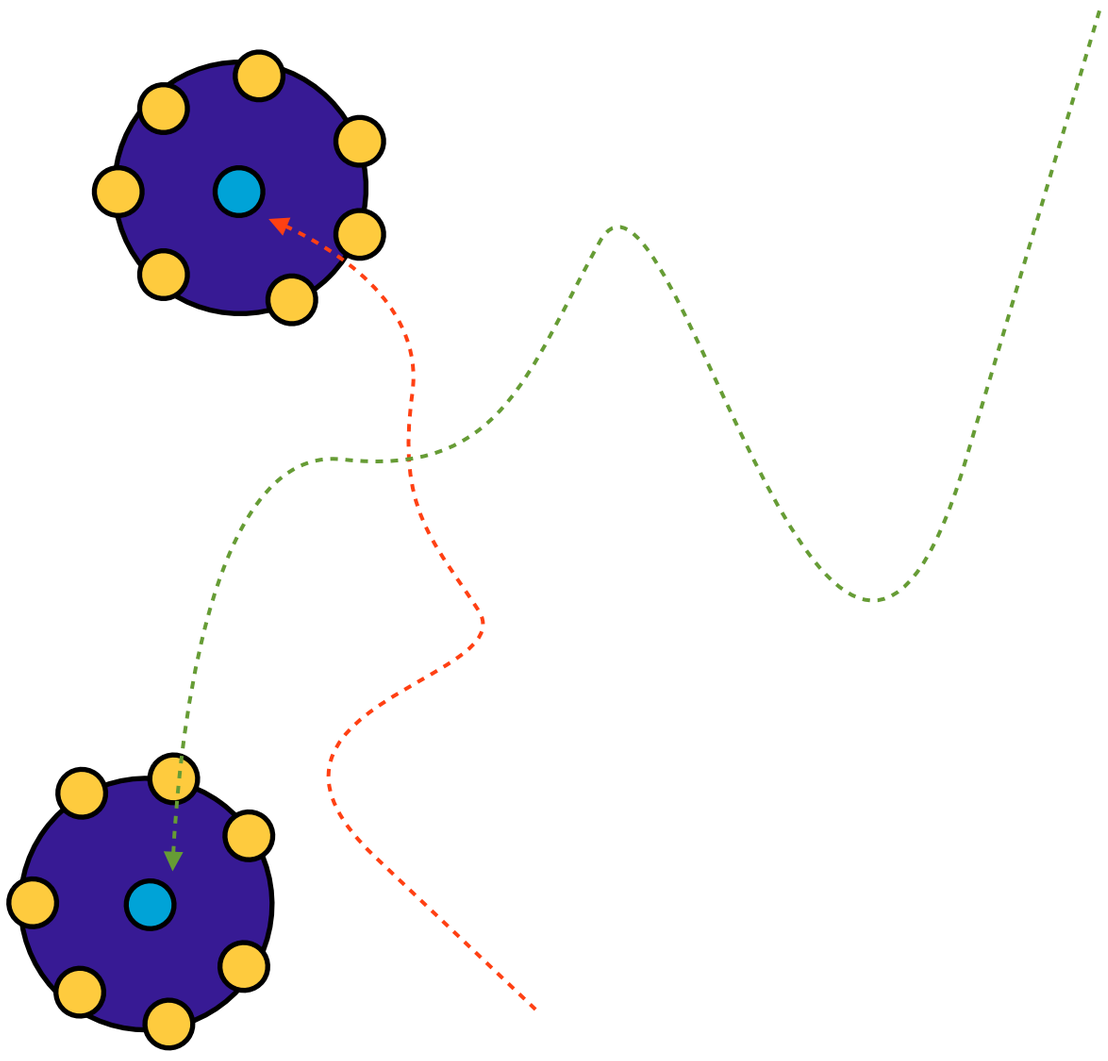
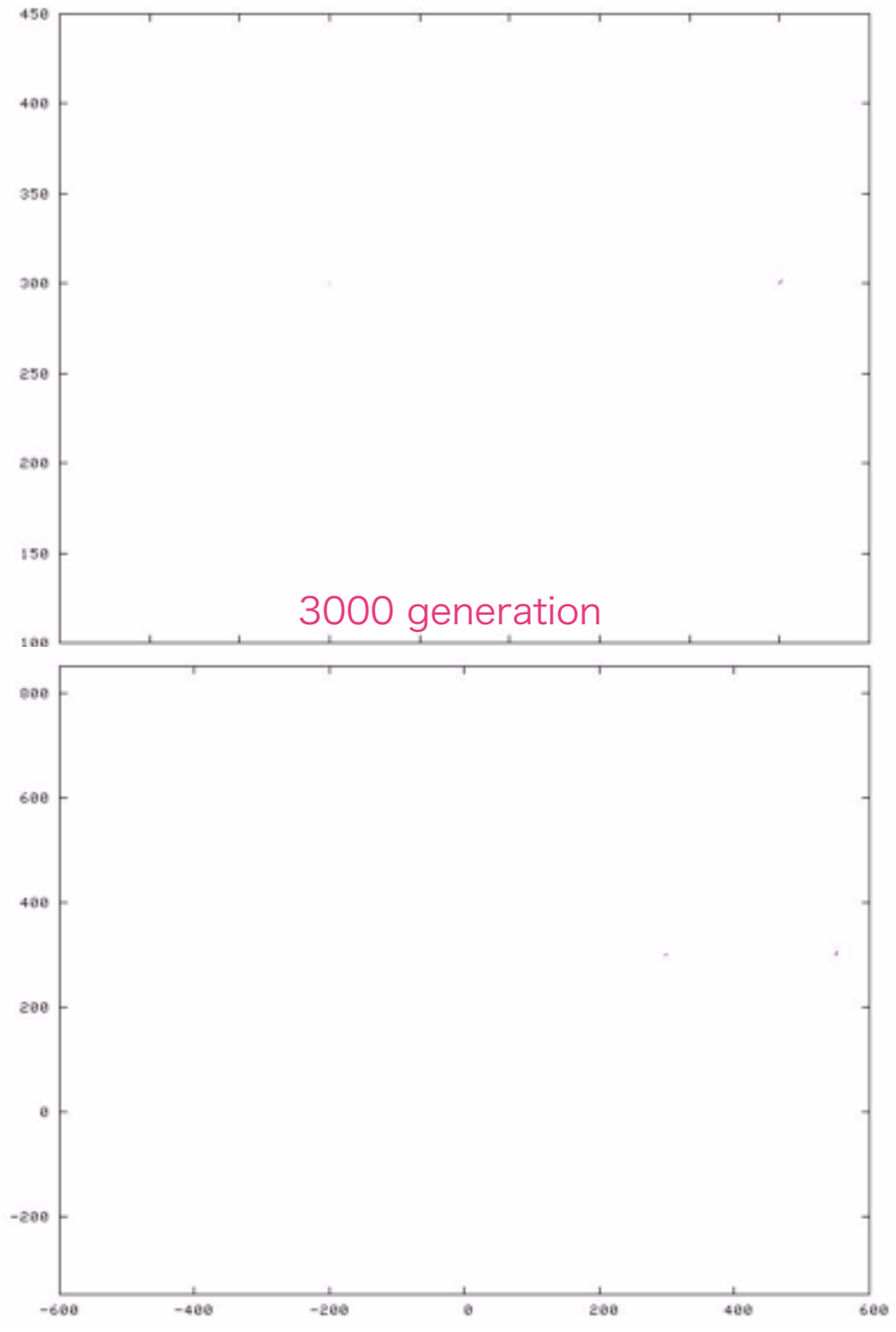
Simulated Social Bugs

Takashi Ikegami

An evolutionary robot approach: each robot is controlled by an artificial neural network with sensors detecting the environmental information. Those neural networks are evolved by a standard genetic algorithm.

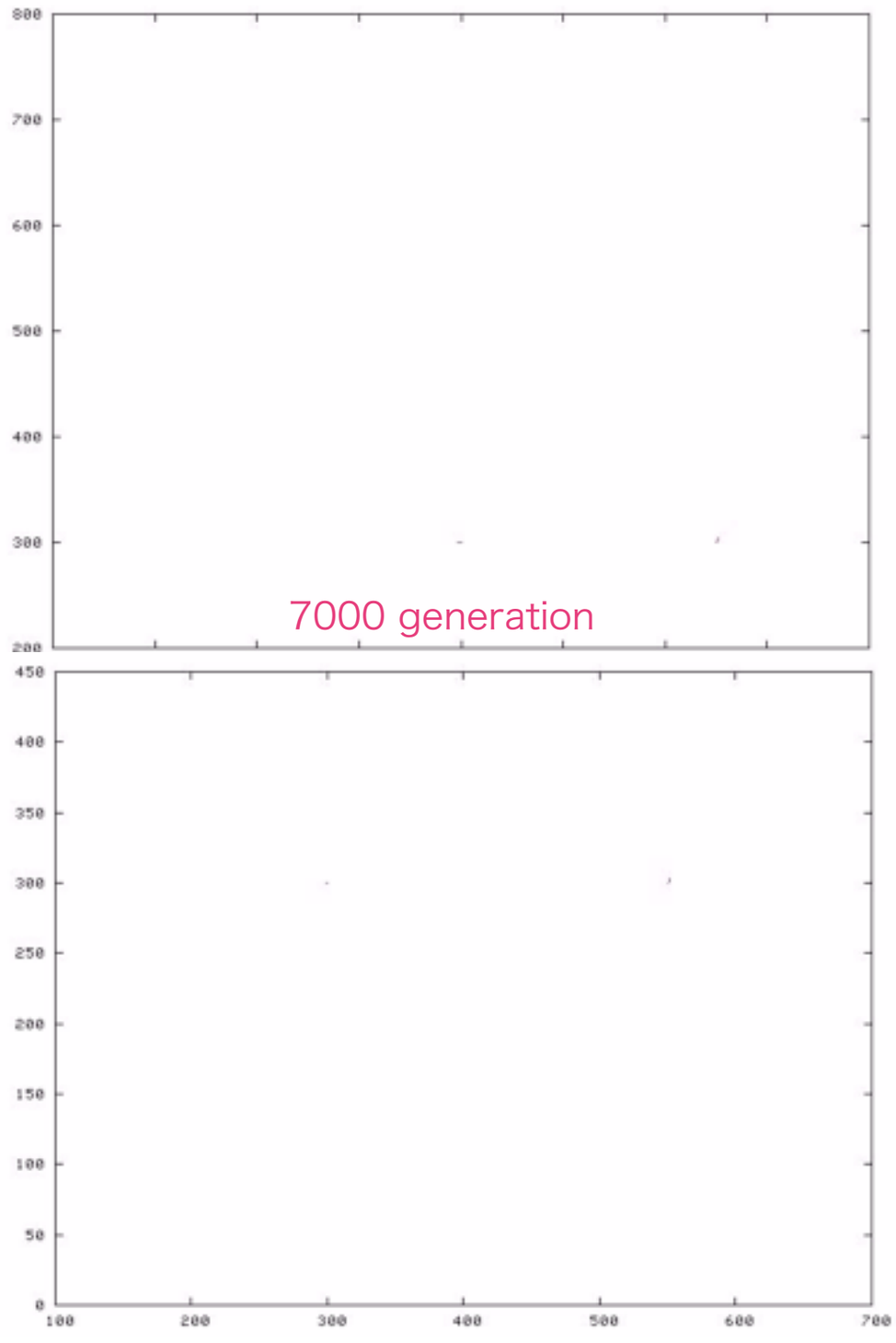


Gentaro Morimoto and Takashi Ikegami: **Evolution of Plastic Sensory-motor Coupling and Dynamic Categorization**, *Artificial Life*, MIT press, 188-193, 2004.



3000 generation

10000 generation

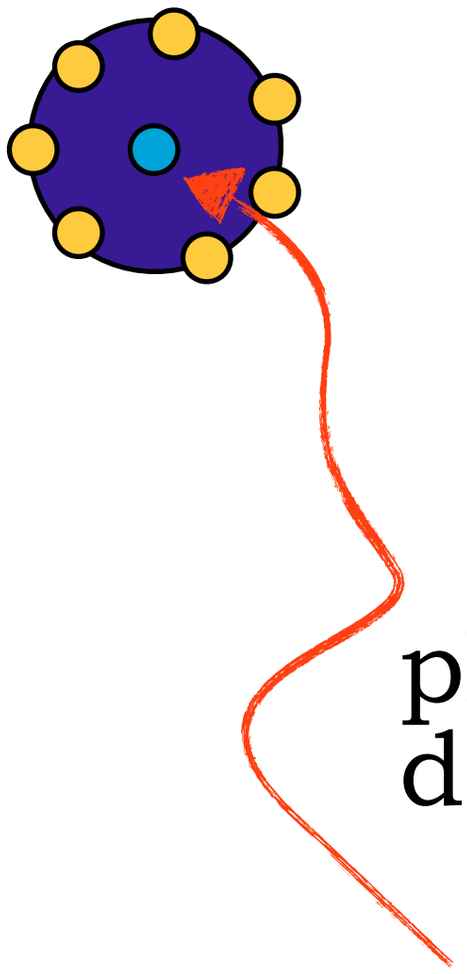


7000 generation

27280 generation

Hiroyuki Iizuka and Takashi Ikegami,**Adaptability and Diversity in Simulated Turn-taking Behavior.** *Artificial Life* 10: 361-378, 2004.

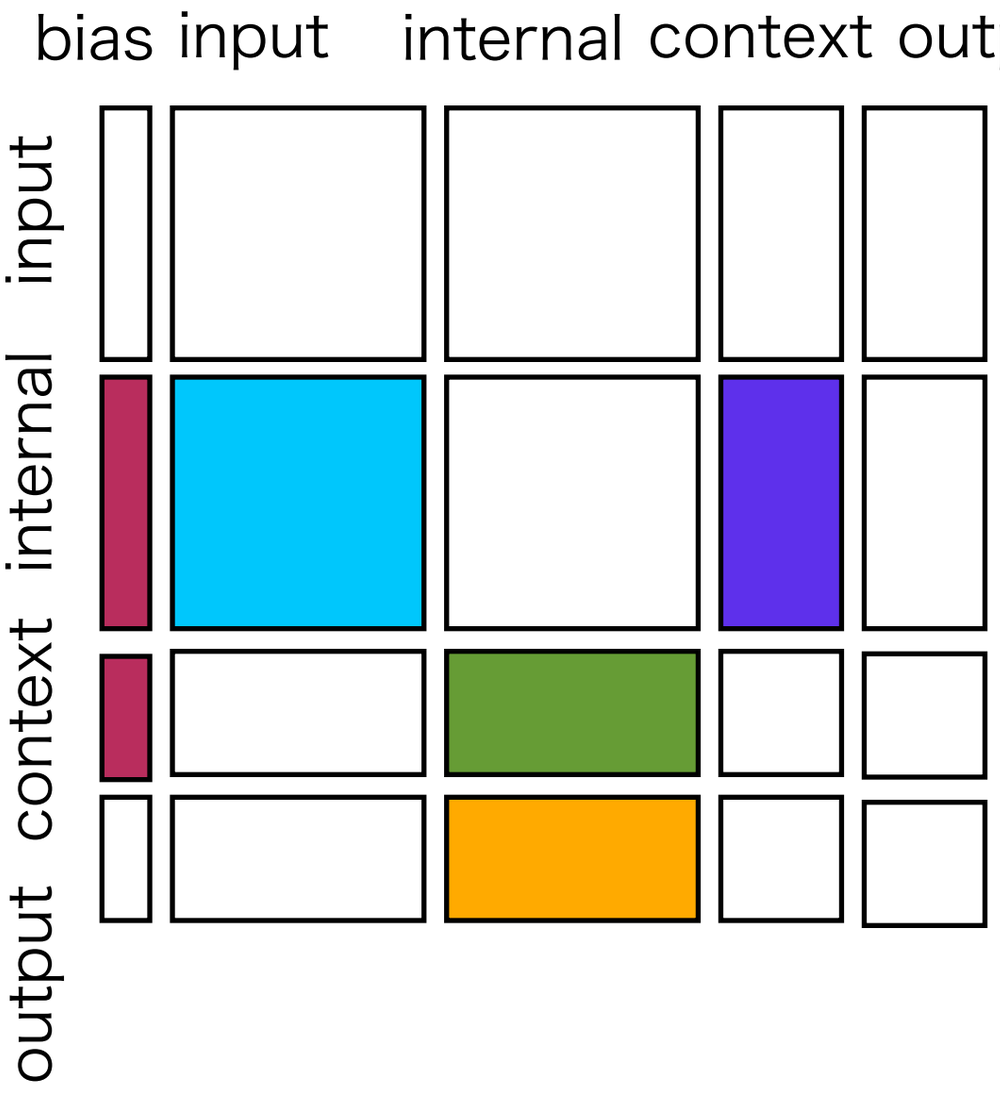
pheromones sensors with the self/non-self differentiation

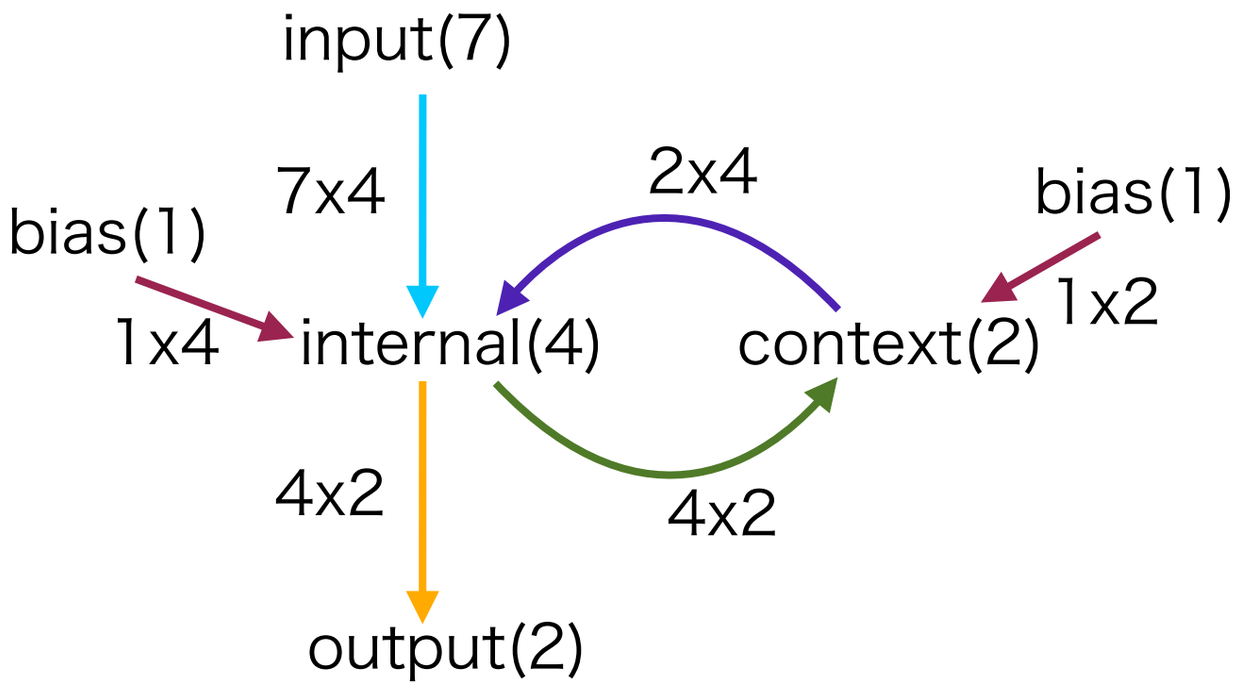


pheromones(ψ) which decays over time

$$\sigma'_k = \frac{1}{1 + e^{-\sum_j w_{kj}\sigma_j}}$$

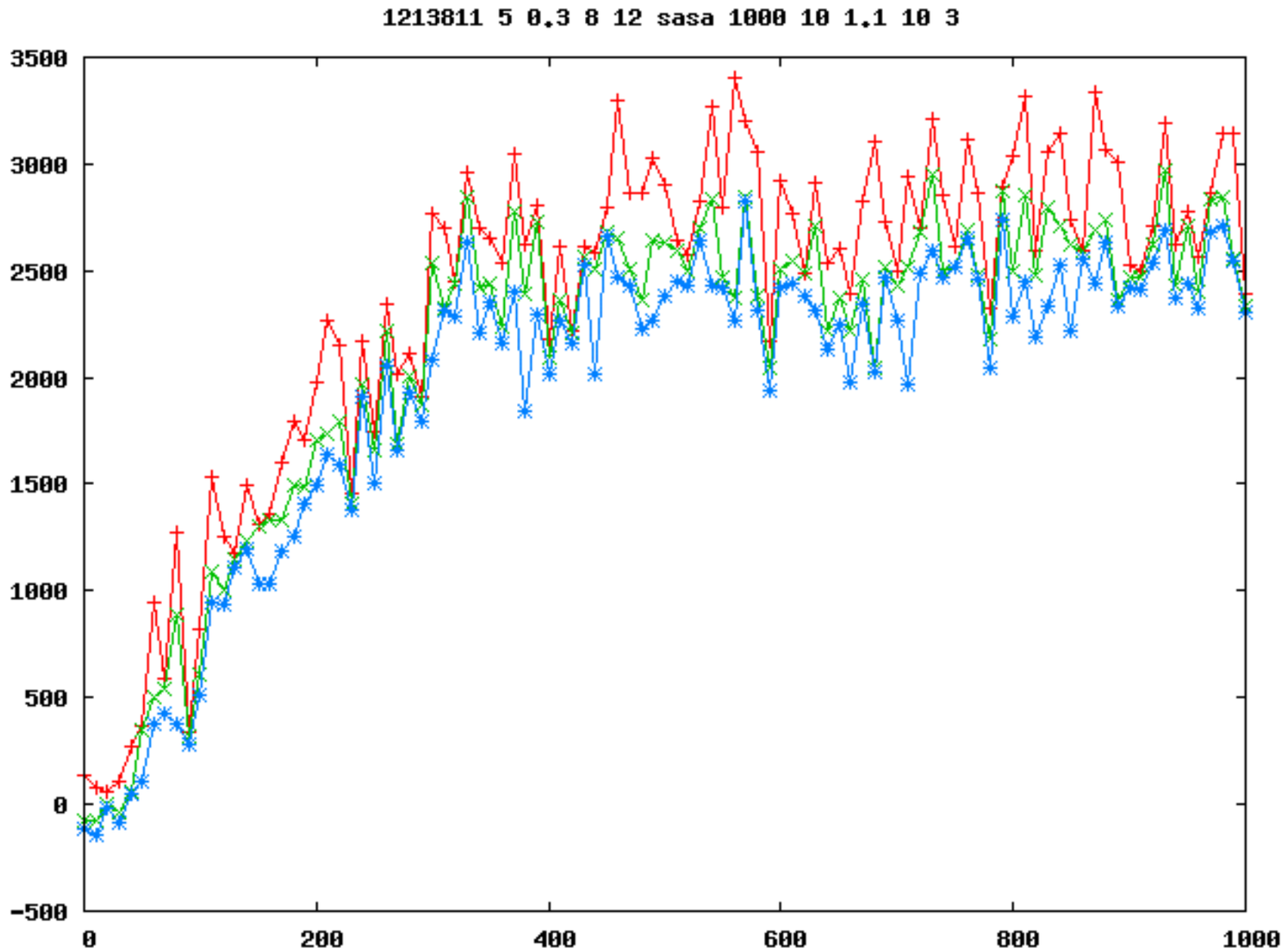
$$\sigma'_k = \frac{1}{1 + e^{-\sum_j w_{kj} I_j}}$$



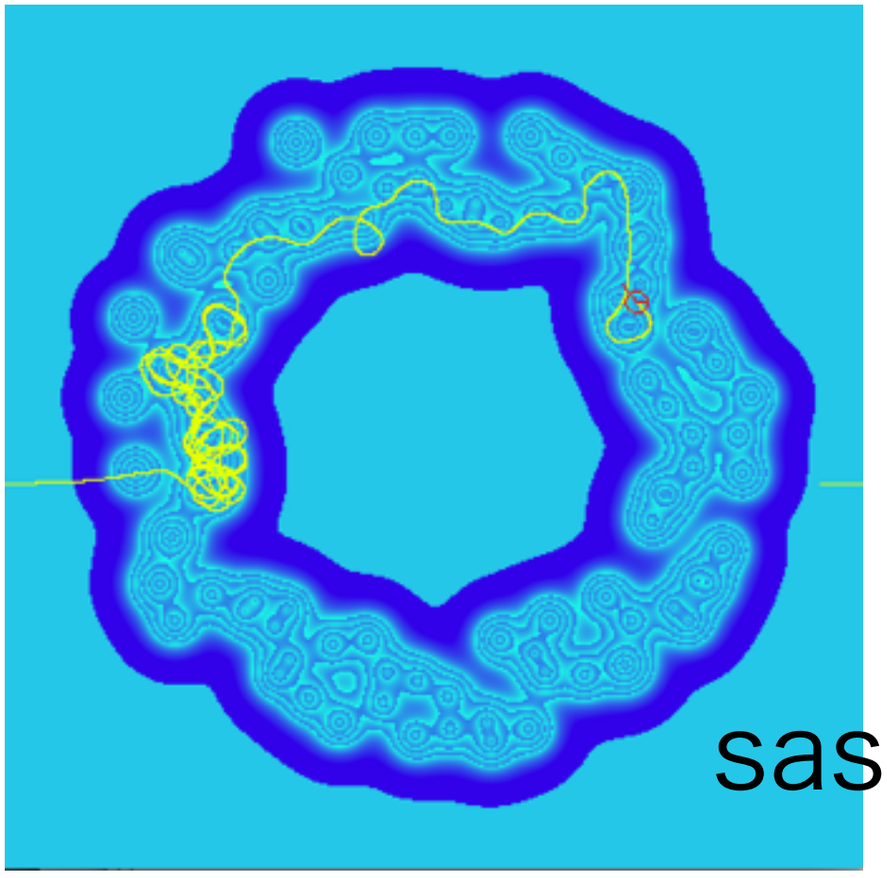


rotation & forward motion

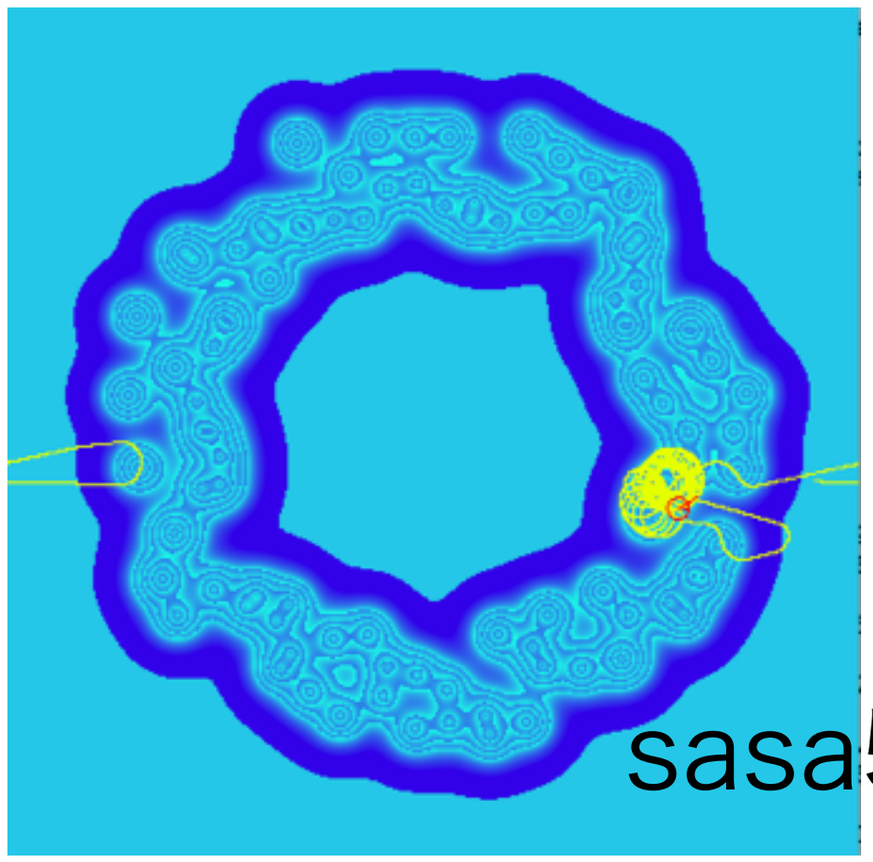
fitness function: $max\left(\int \psi(\vec{r}_c(t))dt\right)$



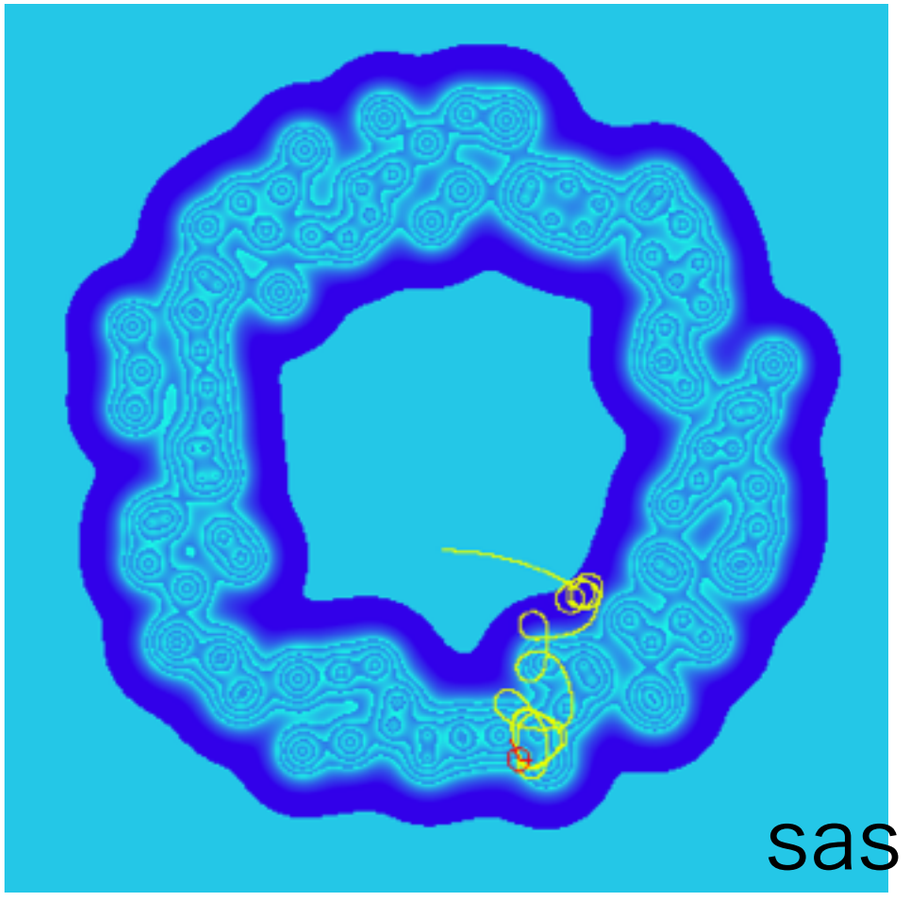
# of agents=20
μ (mutation)=0.3
vehicle size=5



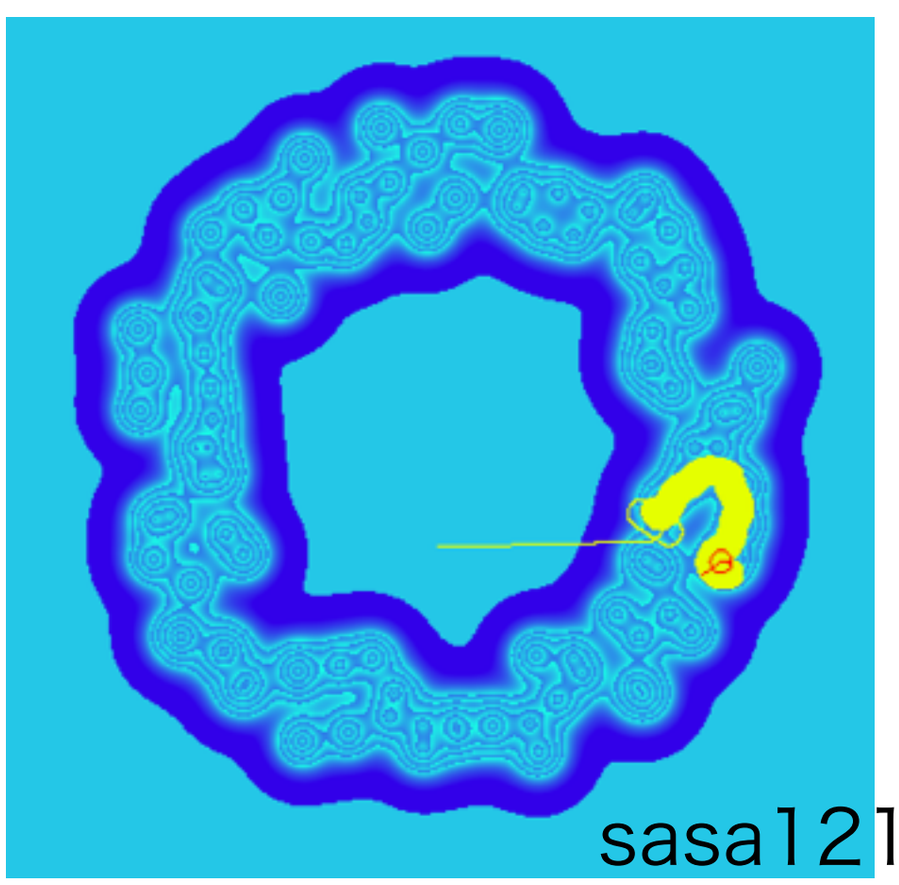
sasa4



sasa5



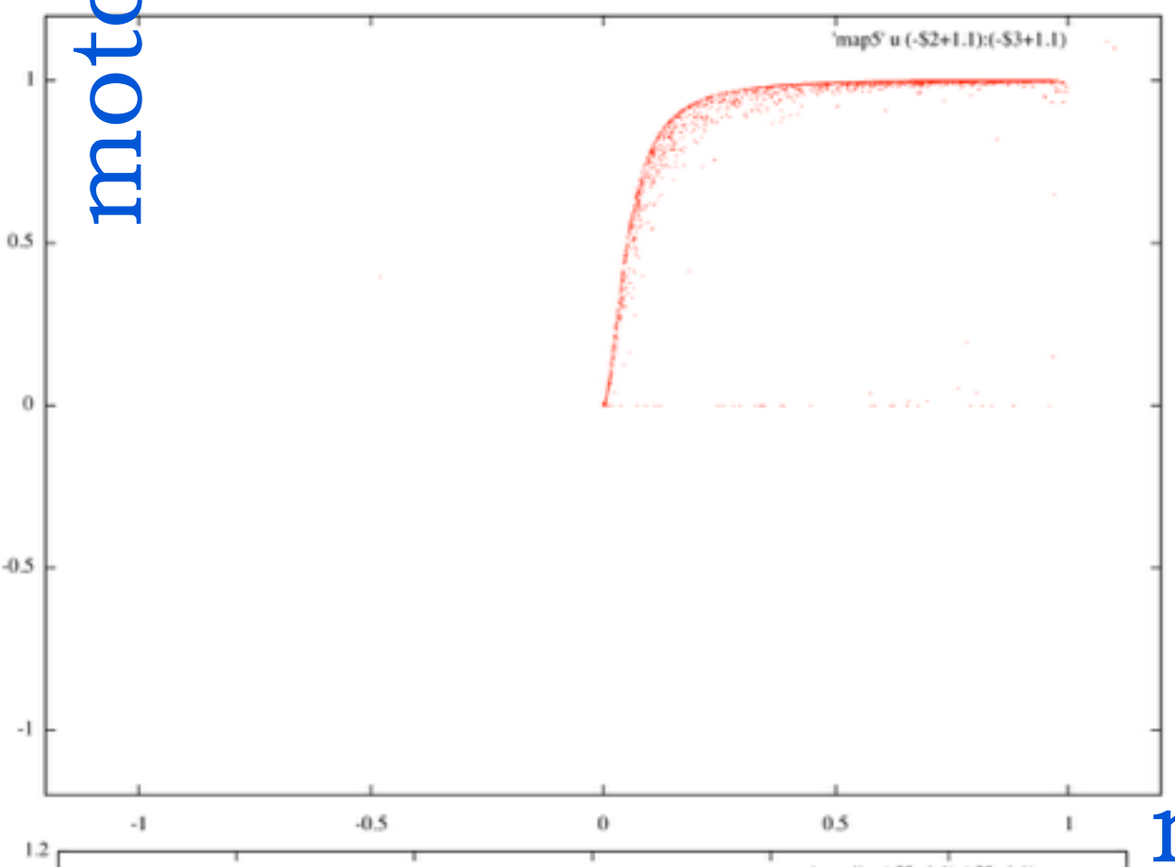
sasar



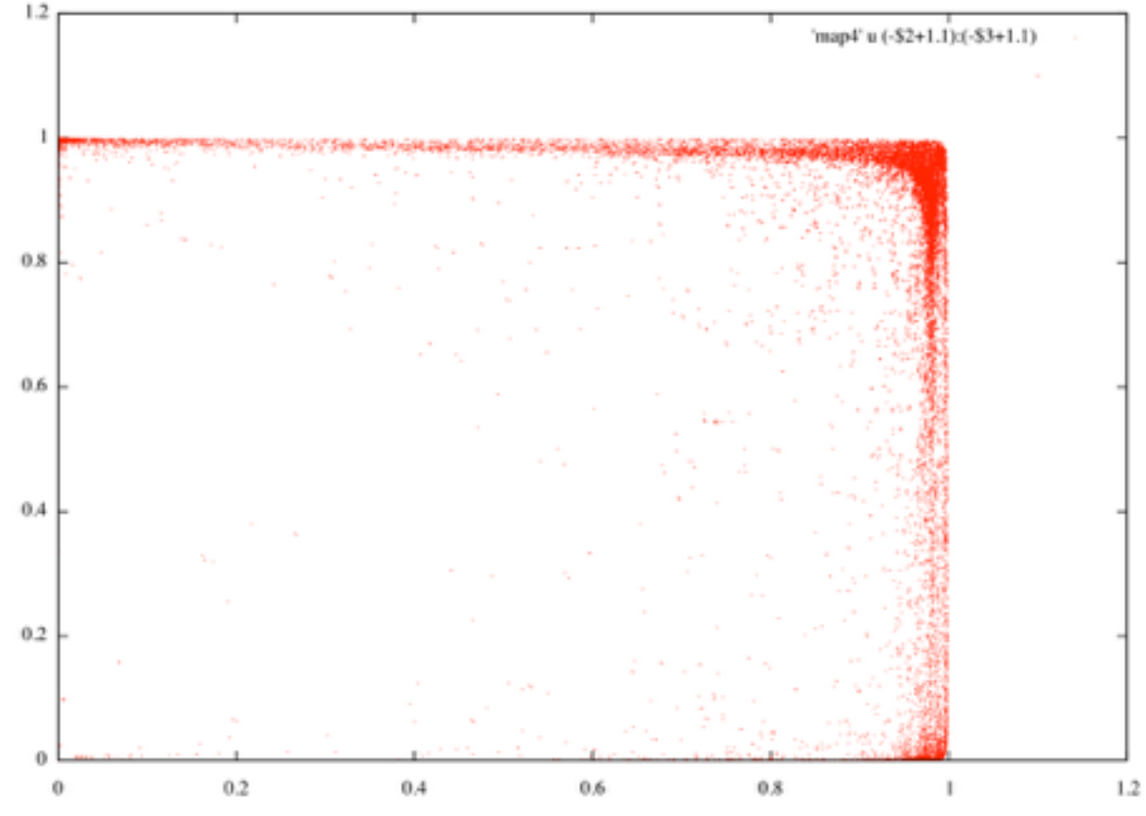
sasa1211

Return maps of the motor outputs

motor2



motor1



Self/non-self discrimination

$$\sigma'_k = \frac{1}{1 + e^{-\sum_j w_{kj} \left(\sum_{m \neq self} I_j^m\right)}}$$

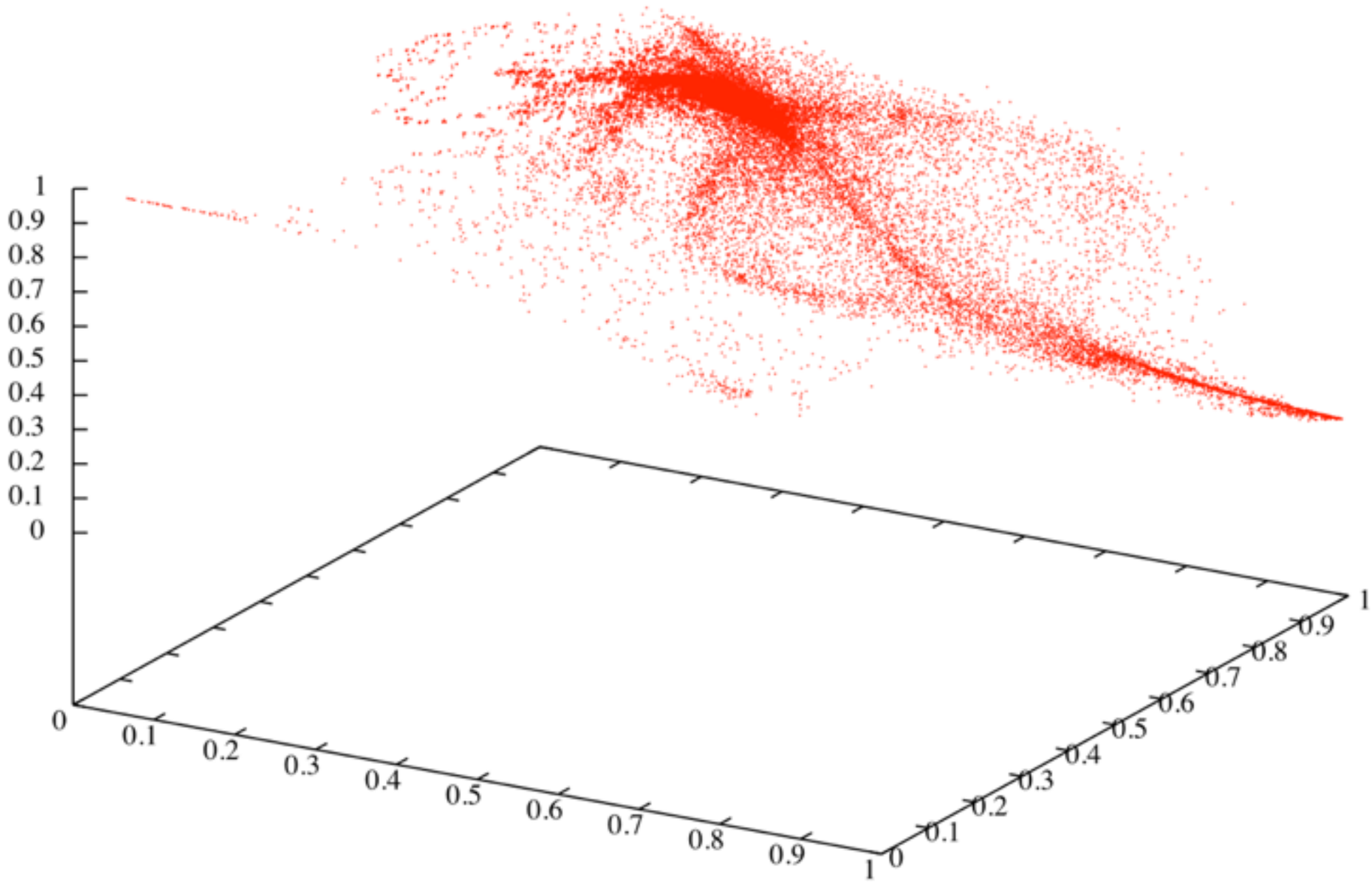
Ant Circle

This video was captured in Guatemala, back in 2007, where I was staying with friends for a youth camp at a small resort. The ants circle took place outside the eatery, after breakfast. The phenomenon only lasted a few minutes; when I returned about an hour later, most of the ants had already found their way into the nearby plants.

Milton Segura

'd1' u 14:17:18

1
0.5
0
-0.5
-1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


1
0.9
0.8
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0.6
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0.4
0.3
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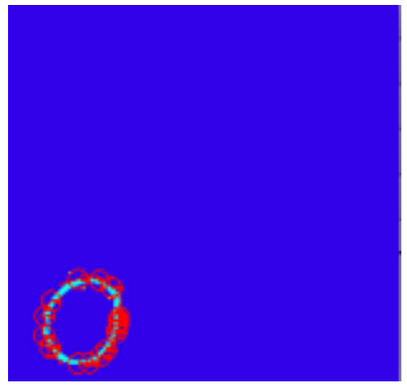
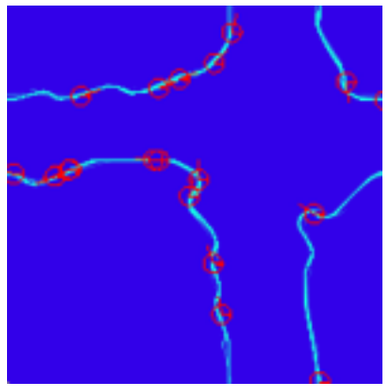
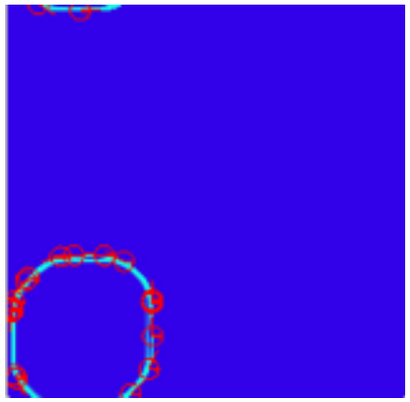
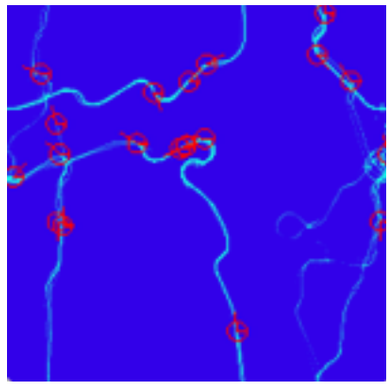
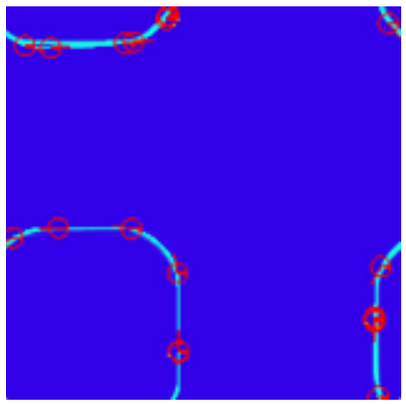
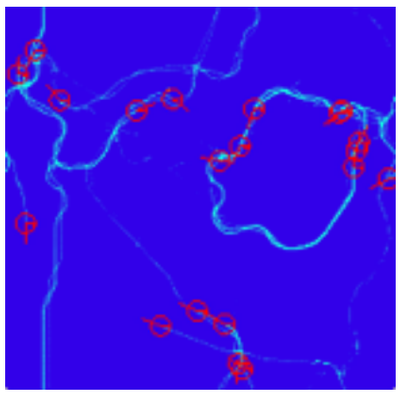
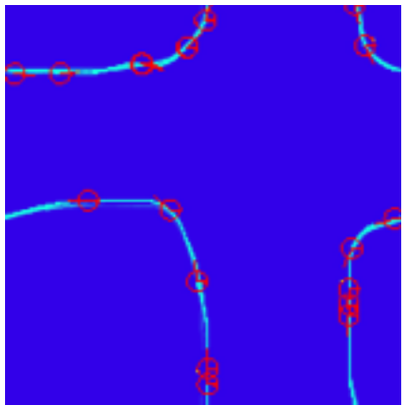
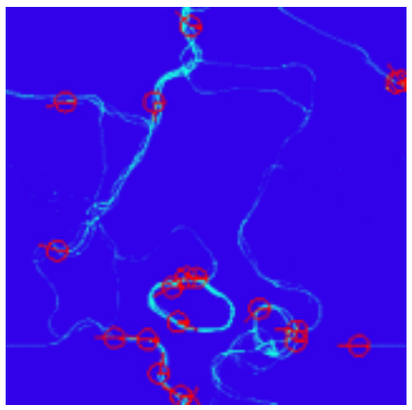
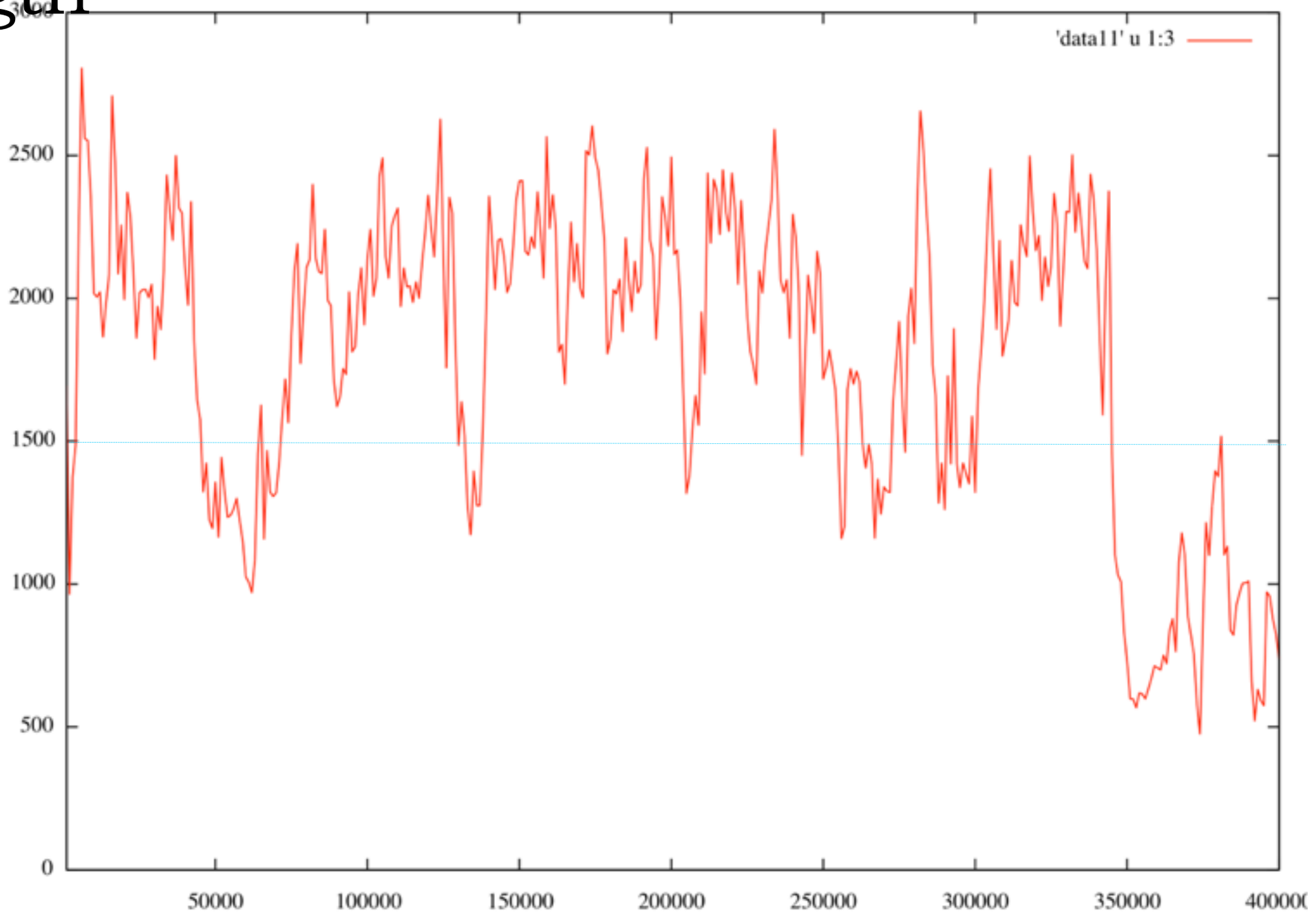
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

How the agents can escape from the death circle traps.

the integrated path length



time step

Discussions

Micro death circles exist for an “optimized” normal nest state, and each agent have unstable sensor-motor coupling to spontaneously escape from the death circle state.