Evomind: Design of Emergent Systems

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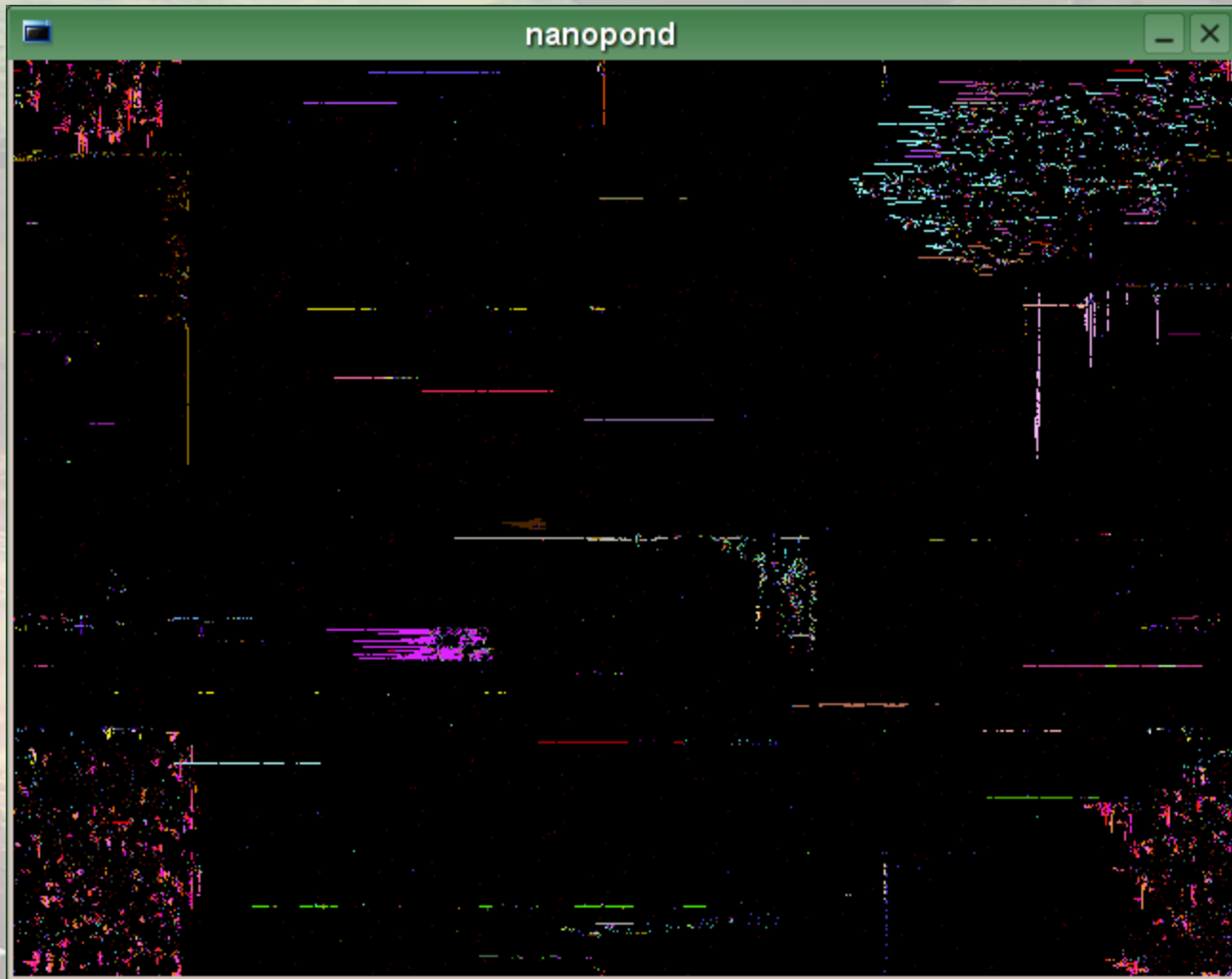
Evomind

"Design of Emergent Systems"

Lecture outline:

- Emergence in current systems

- Evolvable Instruction Set – Neural Net.

- The fitness functions... On systems?

- The best fitness selections to evolve towards.
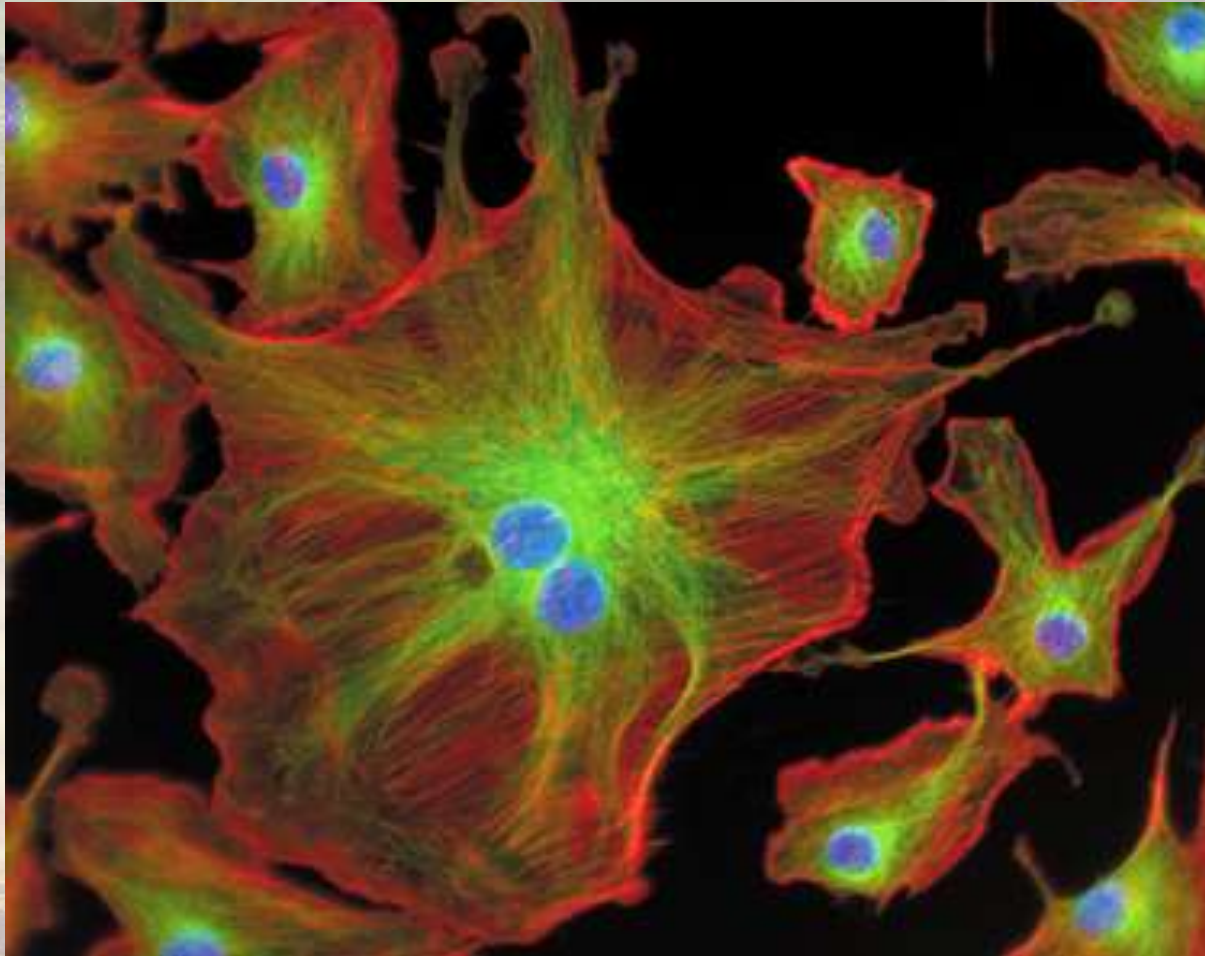
- Suggestions and organisation.

Emergence

- Life! In biology and in Nanopond

- Mathemathics in Avida..

- The fitness functions... On systems?

- The best fitness selections to evolve towards.

- Suggestions and organisation.

Life from Evolvable Instructions
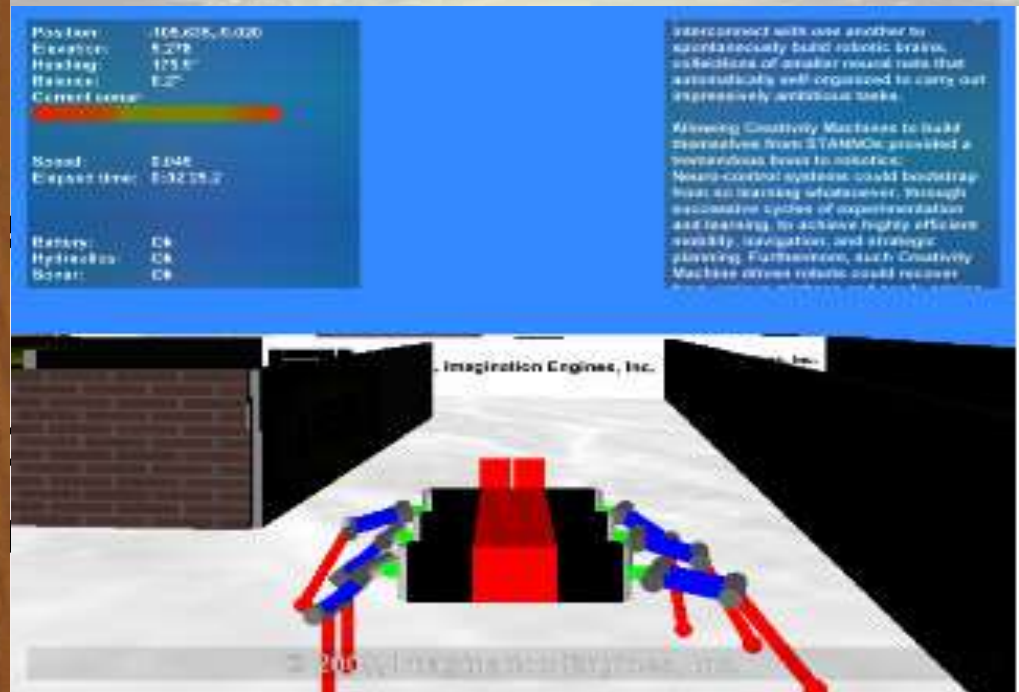
Life from Biology

Mind of Man

- In the brain: 50–100 billion (10^{11}) neurons, 100 trillion (10^{14}) synaptic connections. On a chip there are now some 200 k neurons, just a fraction..

- Human brains develop by learning, they have the ability to remember and imitate and learn specific tasks, often by example, and usually focused on the next task it can handle, thus enabling gradual development.
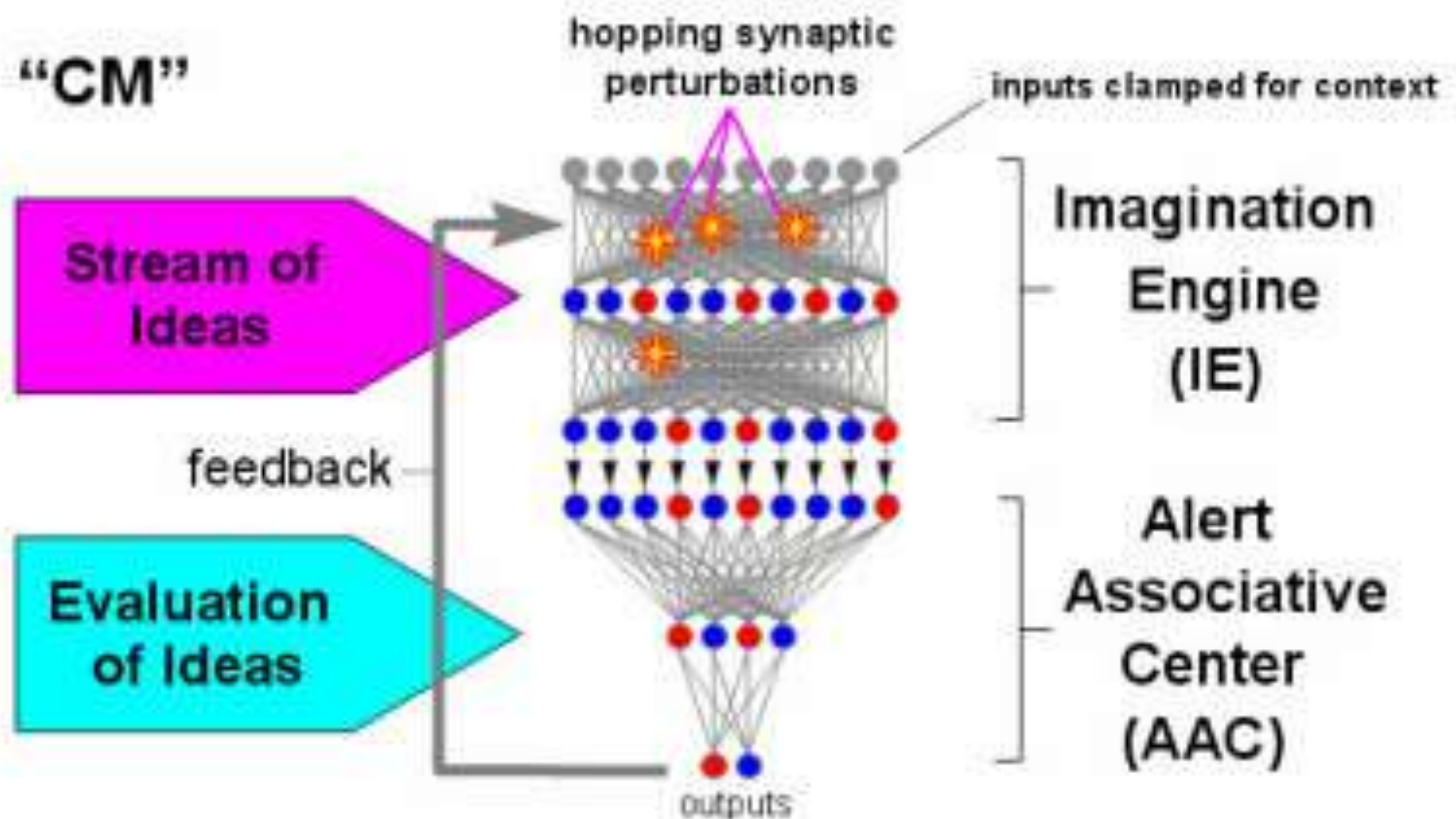
Mind in the machine..?

- Advantages are clear, speed, communication and embodiment of robots
- Computers have access to databases, providing the opportunity for artificial life to learn all our knowledge and more, leading to the Singularity.
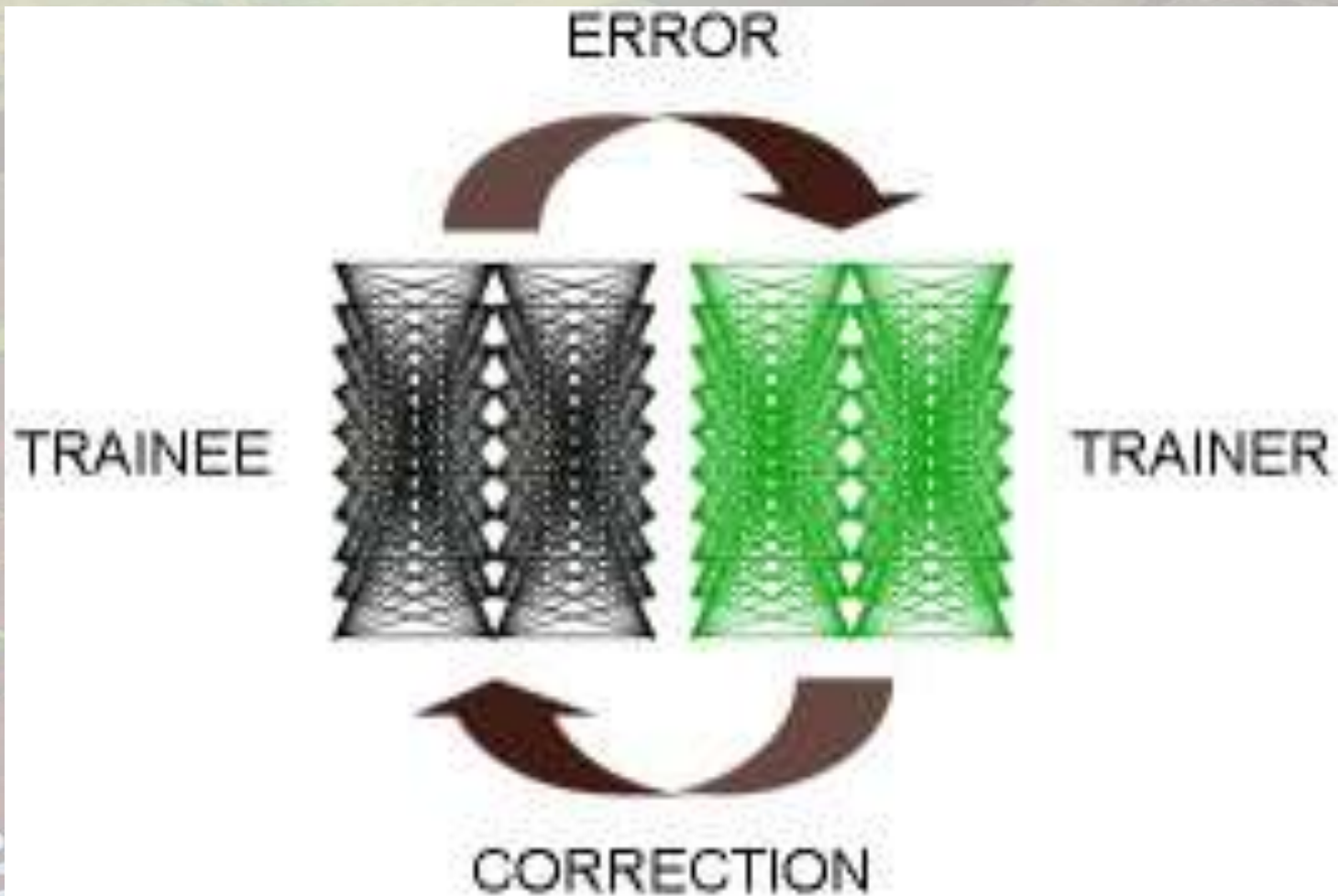
Current AI software and results..

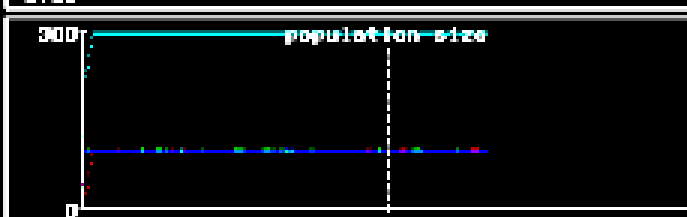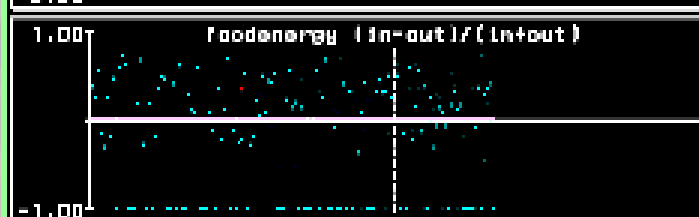- Stephen Thaler's Imagination-engines

- Avida, Tierra, Noble Ape, Polyworld, Darwin@home etc.
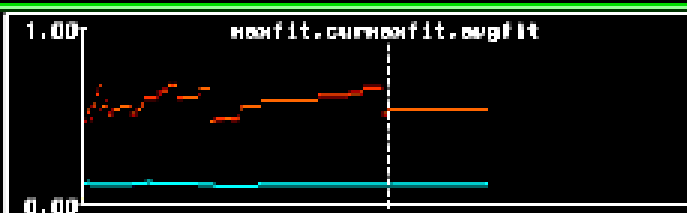
www.imagination-engines.com

"CM"

hopping synaptic perturbations

inputs clamped for context

Stream of Ideas

Imagination Engine (IE)

feedback

Evaluation of Ideas

Alert Associative Center (AAC)

outputs

US05659666, 08/19/1997, Device for the Autonomous Generation of Useful Information

STANNO

Polyworld

48.wf
age = 80458
critters = 300 (100,100,100)
created = 786 (577,52,65)
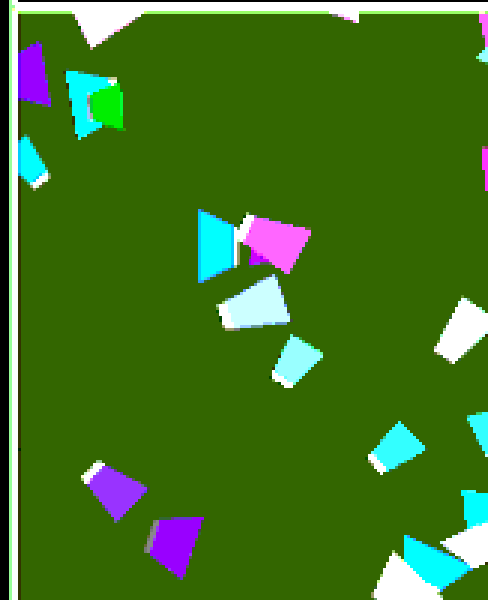 -random = 458
 -two = 331
 -one = 6
born = 48811 (4112,15775,28924)
died = 49306 (4935,15591,28780)
 -age = 5070
 -energy = 12818
 -fight = 18055
 -edge = 13363
food = 266 (88,89,89)
miscden = 16911
agecreat = 48085 (48085,3588,1350)
maxsaper = 4305 (4305,48889,49105)
born/total = 0.98
maxfitN = 1.11
cmaxfitN = 0.54
avgfitN = 0.12
maxfit = 139.097
cmaxfit = 86.2909
avgfit = 14.5185
avgfenergy = 0.04
totfenergy = 0.04

born/(born+created)

maxfit.curmaxfit.avgfit

foodenergy (in-out)/(in+out)

population-size
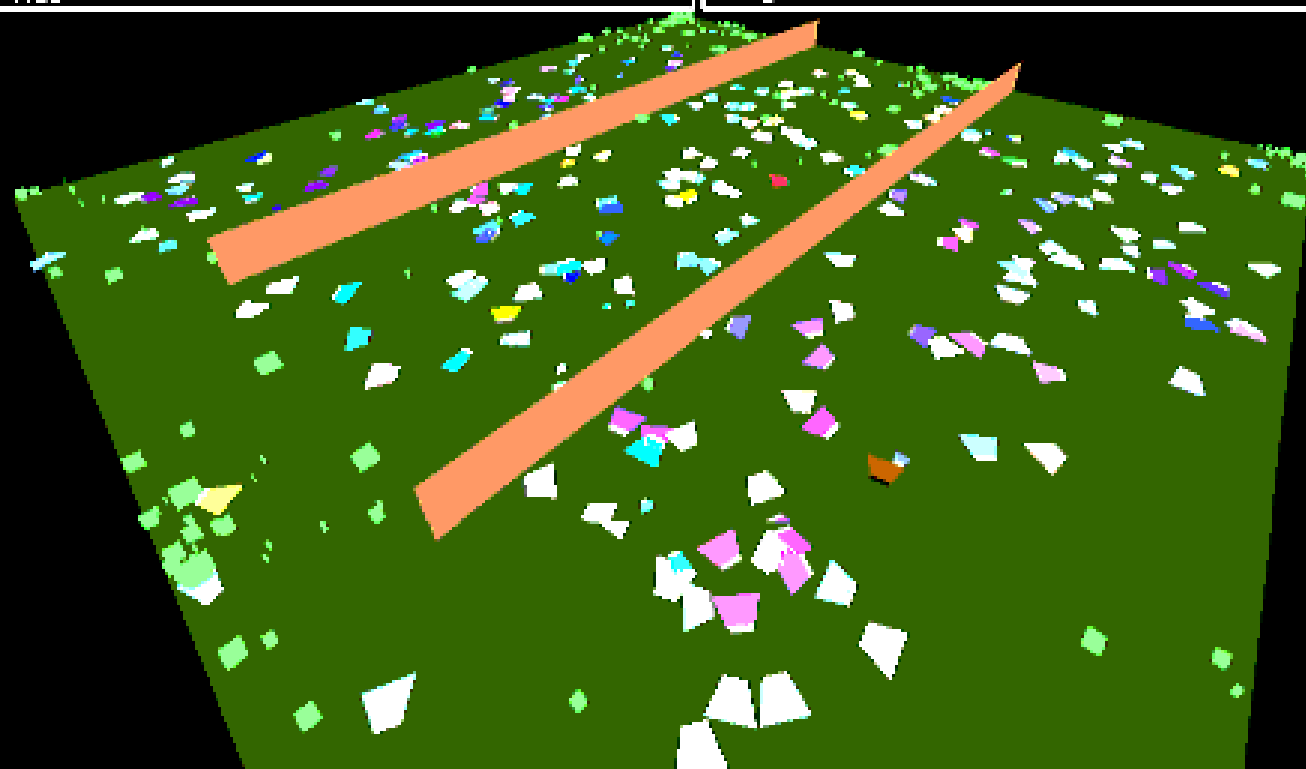
To Evolve a Mind..

- Train the artificial minds on the edge of their abilities, like we train human minds.

- Example: text-to-speech training, providing Alife with texts, allowing them to create sounds and evaluating the sounds with the computer. Using for instance Karaoke rating software.

- The brain often works as a reduction valve, so should the digital mind.

Internal workings :

- Individual Alife forms, like neurons could work in recognition, or in production.

- There would be a central Database of knowledge and abilities, as well as partial databases for individual tests.

- The database would be optimized, unused parts have a chance to be deleted-forgotten..

- There would be an economy of resources.
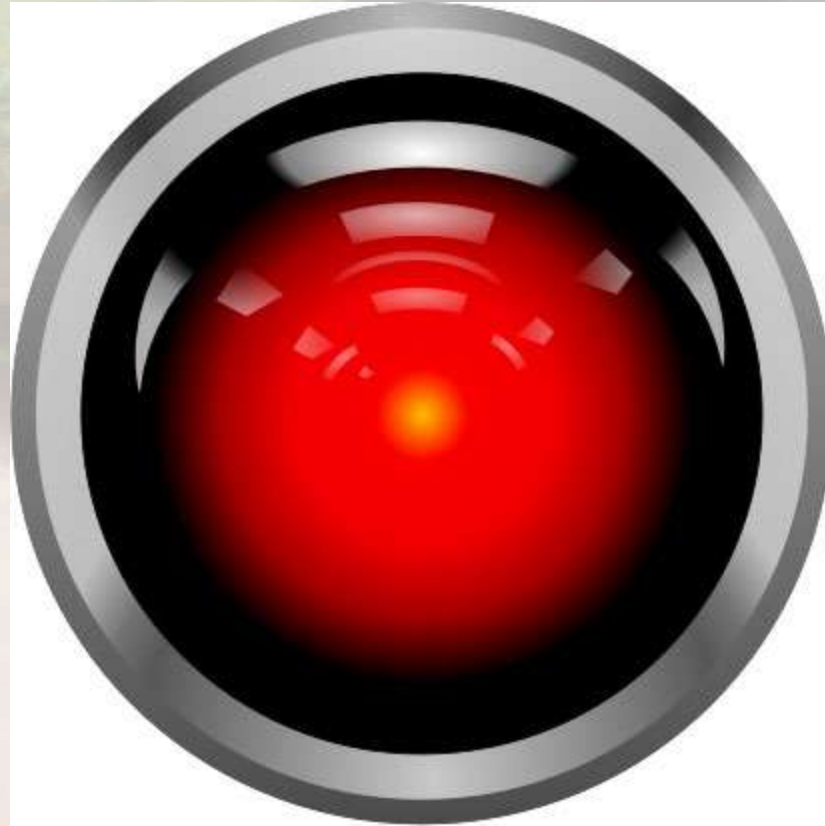
Fitness training

- Text-to-speech: by training from sounds to words to audiobooks there can be open-ended evolution, creating a database able to "read".

- Text to translation: a database can be created for translation, training on dictionaries and different language spoken texts..

- "Understanding" should build up in the "database" as well as the ability to solve new problems, right?

- An open source Aibo-Android smartphone merge

- Could spark enthousiasm globally and train systems to the real world.

Setup of an organisation

We should work on

- Code Design
- Sponsoring
- Idea generation and evaluation
- Volonteers

Thank you!