

Evolution of agents' behavior in the simple ALife model

Mikhail Burtsev

Keldysh Institute of Applied Mathematics, Miusskaya sq. 4, Moscow RU-125047, Russia
mbur@narod.ru

The problem of evolution of purposeful behavior is of a great importance for the understanding of adaptive behavior. This work is continuation of the previous study [1] and devoted to the study of evolution of purposeful behavior.

A clear-cut artificial life model was used to simulate the evolution of behavior in the presented study. The model consists of the world divided into cells and evolving population of agents. The world contains two kinds of objects: agents and randomly appearing patches of resource. Each agent observes part of the local environment and performs certain actions. An agent can move in space and interact with other agents. Every agent has a limited capacity to store the resource internally. When an agent performs an action, its internal resource decreases. If the agent "consumes" the patch of the resource in the knot, the internal resource of the agent increases. When the agent produces offspring, the parent gives half of its resource to the newborn. The behavior of an agent is controlled by simple artificial neural network. The offspring inherits weights of the parent's neural network modified by mutations. If the internal energy resource goes to zero, the agent dies. Detailed description of the model could be found in [2].

The results of simulations with the model demonstrate that simple reflective behavior of agents of initial population (on the left side of the figure) could evolve to much more complex behavior (on the right side of the figure). An important feature of the evolved behavior is that it can be characterized as purposeful. The value of internal variable (energy) plays here the role of motivation which controls switching between foraging and reproduction.

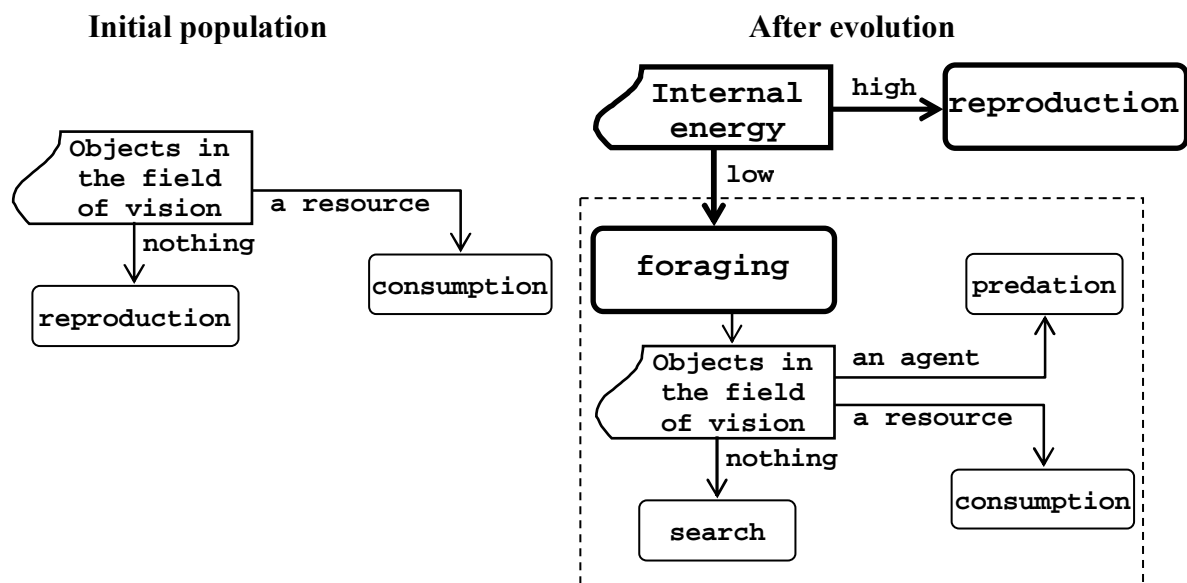


Figure. A charts for the behavior of agents of the initial population (on the left) and of the population after evolution (on the right).

References

1. Burtsev M.S., Red'ko V.G., Gusarev R.V. (2001) "Alife Model of Evolutionary Emergence of Purposeful Adaptive Behavior" // In. J. Kelemen, P. Sosik (Eds.): Advances in Artificial Life, proceedings of 6th European Conference, ECAL 2001, Prague, Czech Republic.
2. Burtsev M.S. Tracking the Trajectories of evolution // Artificial Life, 2004. Vol. 10, Iss. 4. (in press)