

INCREASING THE EFFICIENCY OF THE TWEANNS ALGORITHM IN THE EVOLUTION OF BOTS

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Some modifications of the NEAT method ([1]) in the evolution of bots were investigated, the strategies of improving its "physical constitution" and "intellectualization of behavior" were competed [2]. The first provides the neural network with input signals from various sensor types, physical abilities to interact with the environment, and the second controls the bot's response. Two-dimensional space as the environment was used, which is optimal for this study in several factors, such as the relative simplicity of both calculations and visualization and sufficiency for representativeness. During the simulation, the environment dynamism was ensured, by randomly located energy resources creation and the change of space size. Distinctive features of modification are the input and output neurons type indication that determine the constitutions of the organism, replacement of the gene deactivation operator by gene deletion, deleting the genes of the corresponding connections when deleting the gene describing a neuron. Other distinguishing features are adding link gene numerical coefficient mutation operator, link genes adding when a neuron appears through mutation. Numerical experiments demonstrated the advantage of the neural network progressive development strategy, achieved through a series of metasystem transitions [3], caused by natural selection in the population of virtual biocenosis bots. The ways of further research in the direction of attempts to build virtual models, in some sense reproducing the phenomena of communication and socialization (cooperation), are outlined.

References: 1. *Stanley, Kenneth & Miikkulainen, Risto.* (2002). Evolving Neural Networks through Augmenting Topologies. *Evolutionary computation*. V10. Pp. 99-127. DOI 10.1162/106365602320169811. 2. *Alexander G. Yushchenko & Mykhailo Zachepylo.* (2020). Modeling of evolutionary conditioned noogenesis of virtual biocenoses. DOI 10.13140/RG.2.2.30785.38246. 3. *Valentin Turchin* (1977): *The Phenomenon of Science. A cybernetic approach to human evolution*, Columbia University Press, New York.