

SENSORY STRATEGIES FOR NEURAL NETWORKS IN SELF-EVOLVING BOTS: A COMPARATIVE ANALYSIS

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A comparative analysis of sensory strategies for neural networks in self-evolving bots is presented in this study, based on the idea of modeling evolutionarily conditioned noogenesis of virtual biocenoses [1]. The bots with limited information about the environment had different strategies for obtaining sensory information about objects around them, which were compared [2]. The objects considered in the study were obstacles that limit the movement of bots and resources required for their survival. Three strategies based on distance ray interception with objects were compared. In the first strategy, multiple neurons were used for each sensor ray, with each neuron specialized in reacting to a specific type of object, gaining activation according to the distance to the intersected object. In the second strategy, two neurons were used for each sensor ray, with one indicating the scale of activation and another activating based on the type of object. In the third strategy, several neurons were used for each sensor ray, with one indicating the scale of activation and others indicating the type of object intersected using one-hot encoding. Numerical experiments were conducted to evaluate the differences in the shape of the neural network bots developed using the competing strategies, as well as the patterns in the behavior of the developed bots. The efficiency of the evolving bots was also compared using the speed of population adaptation to form a balanced system. The potential application of these strategies in the development of more efficient and adaptable bots for improved navigation and interaction with the environment is highlighted.

References: 1. *Yushchenko, A.G., & Zachepylo, M.O. (2020). Modeling of evolutionary conditioned noogenesis of virtual biocenoses DOI 10.13140/RG.2.2.30785.38246 (Preprint).* 2. *Yushchenko, A.G., & Zachepylo, M.O. (2021). Increasing the efficiency of the TWEANN algorithm in the evolution of bots. Proceedings of the VIII International Scientific and Technical Conference on Informatics, Control, and Artificial Intelligence, Kharkiv-Kramatorsk, Ukraine. – P. 150.*