

**NEAT-POWERED SELF-EVOLVING BOTS:
ADAPTING TO DYNAMIC ENVIRONMENTS**

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This study investigated the application of the NeuroEvolution of Augmenting Topologies (NEAT) [1] method for self-evolving bots capable of adapting to dynamic environments. Based on the idea of modeling of evolutionary conditioned noogenesis of virtual biocenoses [2], modifications to the NEAT method, in order to enhance the "physical constitution" and "intellectualization of behavior" of bots, leveraging the findings of previous research [3], are proposed. Focus on the effects of dynamic environments was made. Obstacles are not only randomly placed, but also change their location over time, leading to variations in resource availability and navigation challenges for bots. Another dynamic environment element is the seasonal restoration of resources, which are essential for the survival of bots the number of restored resources is changing over time. Numerical experiments made it possible to estimate the performance of NEAT-powered self-evolving bots in this dynamic environment and revealed differences in the dynamics of the evolution process and the upper optimum boundary of the population size and average lifetime metrics. The study identified divergent trends in the strategies developed for obstacle-omitting and resource-seeking behaviors. The advantages of adaptive bots in dynamic environments, including increased "evolutionary pressure" and efficiency, are highlighted. Insights for further research in modeling more complex environments with different sub-biomes, cycled variables, cataclysms, bot self-analysis, communication, and socialization phenomena in virtual biocenoses, are provided.

References (translated):

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3. Yushchenko, A. G., & Zacheplyo, 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.