

An individual-based evolving predator-prey ecosystem simulation using a fuzzy cognitive map as the behavior model

Gras R., Devaurs D., Wozniak A., Aspinall A. *Artificial Life* 15 (4): 423-463, 2009. Type: Article

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An innovative approach to individual-based predator-prey behavior by a fuzzy cognitive map (FCM) is presented in this paper. The authors hint that "our system is the only one that allows the modeling of links between behavior patterns and speciation," based on individuals and not on the traditional environmental approach. There is no doubt that this approach is powerful. It has a great potential to influence future ecosystem studies. However, the presented results, self-described as "very promising," are based on hypothetical data; the real data may be hard, if not impossible, to obtain.

I find it strange that in the entire text, there is not one use of the term "membership function." In addition, the text, "Concepts (1) to (8) are computed by fuzzification [using ternary mode (b) from Section 2.1]," is repeated several times, without giving grounds for the use of the "ternary mode" or its threshold values. This deficiency constitutes a fundamental problem. In fact, the mysterious "ternary mode" is reduced to the arbitrarily assumed threshold (for example, 80 percent in Figure 1) and the use of a linear function. In real-world applications, each individual animal would need to be given a specific membership function that describes its trait. For a large population, it may be impossible to do so.

The FCM approach proposed by Gras et al. could provide valuable results, once membership functions are defined for all individual agents (for example, in a large herd of animals). By contrast, no convincing argument is presented to support a conjecture that such results could be achieved by fuzzification, using the ternary mode. Potentially, membership functions built on the generalized bell membership function are needed to reflect the normal distribution of complex traits that are influenced by more than one factor (genetic or environmental).