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APPLICATION OF FUZZY LINGUISTIC COGNITIVE MAPS TO PRISONER'S DILEMMA

Vesa A. Niskanen

Department of Economics & Management
University of Helsinki
P.O. Box 27, 00014 Helsinki, Finland
vesa.a.niskanen@helsinki.fi

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Abstract. *Fuzzy linguistic cognitive maps are considered. These maps are also applied to simulation of the well-known prisoner's dilemma. This dilemma has provoked various challenges to game theory and decision making. By virtue of our approach we can use fuzzy rules and reasoning when computer models are constructed. We also aim to show that our approach seems usable in general when complicated phenomena of the real world are simulated with computers.*
Keywords: Fuzzy linguistic modeling, Fuzzy cognitive maps, Prisoner's dilemma

1. **Introduction.** Complicated phenomena of the real world are still problematic for computer modeling. This is due to the fact that these phenomena can constitute networks which include several nodes with various causal and teleological interconnections. In addition, their nodes may include non-numerical, imprecise or uncertain entities. In particular, we encounter complicated phenomena when we perform research in human sciences because a human being as such is a very complicated object of study.

In human sciences two principal methodological traditions for resolving the foregoing problems are quantitative and qualitative approaches. The former assumes that we can apply similar methods to both the animate and inanimate world, and these methods usually have their origins in natural sciences. In philosophy, this idea of methodological monism is particularly maintained in positivistic approaches.

The qualitative tradition, in turn, presupposes that studies on human beings should apply additional methods that better take into account features characteristic of people such as their intentional behavior. The so-called Geisteswissenschaften (e.g. hermeneutics and phenomenology) usually provide a philosophical basis for this approach [15].

To date there has been a methodological controversy between the quantitative and qualitative traditions but by virtue of certain novel methods in computational intelligence, such as fuzzy systems, neural networks, evolutionary computing and probabilistic reasoning, we can now adopt both of these approaches and also study complicated phenomena better in a computer environment. Below we apply ideas of computational intelligence, in particular fuzzy systems [15,21,22].

As regards fuzzy systems, most of its models are still merely based on fuzzy set theory. This approach is widely adopted in engineering sciences and their applications. However, in human sciences we should apply more actual fuzzy linguistic models in order to obtain