

Book reviews

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Fuzzy Cognitive Maps and Neutrosophic Cognitive Map

Xiquan, Phoenix 2003.

210 pages.

ISBN 1-931233-76-4.

23.55 \$.

The rapidly extending range of real or potential applications of modern mathematics and computer science has led to a general and already well recognized phenomenon: an urgent demand for qualitatively new instruments for effective modelling those features of reality which were rather ignored by the classical deterministic methods. It seems that this demand was, at least mostly, satisfied by the existing and already well developed models of multivalued logic, probabilistic logic, fuzzy set theory, rough sets and other mathematical or meta-mathematical models. Nevertheless, there still appear some rather marginal attempts to develop further alternative methods modelling different structures of indeterminism, and to suggest some formalism for their processing. The vitality of such attempts can be hardly estimated from their abstract formulation, only. It can follow rather from their applicability in the targeted models of reality, especially from the exclusivity of their adequacy to some cases of uncertainty or complexity.

The referred booklet, by my opinion, belongs to such works. It is worth informing about them but their assessment cannot avoid certain criticism or even doubts about their real contribution to the human knowledge. The publication is devoted to the methods of cognitive maps and relational maps which are known and used in the practical analysis and optimization of organizational and structural relations. Formally, a cognitive map is an oriented graph where nodes represent concepts (events, policies, attributes, ...) and edges represent causalities. The technique of cognitive maps is used in the branches combining some problems of mostly social (sociological, economic, ...) or biological sciences with some formal tools coming from mathematics, from the theoretical background of artificial intelligence like knowledge processing, etc. The illustrative examples presented in the referred book, and some of the references show that there exist situations in which the cognitive or relational maps can be effective and useful. The usual type of situations modelled by the cognitive maps is naturally connected with some type of uncertainty which cannot be eliminated. It means that the implementation of some type of non-standard logic into the model is desirable.

The book refers in this context about the fuzzy logic and so called neutrosophic logic. The latter one follows from the concept of neutrosophy formulated by one of the authors as a "philosophy of neutralities", and it can be rather more realistically characterized as a modification of the fuzziness where the degree of uncertainty is described in a more general way. Namely, instead of the numerical membership measure it is classified by means of three sets of values: the truth, indeterminacy and falsity ones. Certain parallelism with the rough sets can be observed.

The text presented after the selfconscious introduction mentioning the "philosophy" of neutrosophical concepts is formally divided into three chapters, where the third one is devoted to the list of briefly formulated "*Suggested Problems*". The essence of the publication is presented in two chapters titled "*Basic Concepts About Fuzzy Cognitive Maps and Fuzzy Relational Maps*" (its sections are devoted to definitions, properties and models of fuzzy cognitive maps and fuzzy relational maps, their applications and illustrative examples including linking of fuzzy relational maps) and "*On Neutrosophic Cognitive Maps and Neutrosophic Relational Maps – Properties and Applications*" (with sections subjected

to the basic concepts of neutrosophy, its structures, neutrosophic graphs and maps, their examples, illustrations and applications, comparison with fuzzy cognitive maps and neutrosophic cognitive maps). Both chapters have similar formal structure. They contain series of definitions combined with many numerical (or, better said, practical) examples, partly illustrating the presented concepts, partly characterizing possible applications of the model. There are only a few theorems, vast majority of which comes from the referred literature (not by the authors of this book). The mathematical formalism is correct and understandable even for readers which are not mathematicians.

The usefulness of the referred book, and the specification of the circle of its eventual readers, depends on the comparison of the presented methods with other approaches to similar problems and to analogous challenges of the reality. The comparison of the practical advantages of (especially) neutrosophic methodology with the existing and widely used methods of optimization and organization of complex systems could be useful, and it deserves more attention (and more explicitness) than which is given to this subject in the referred text. A separate section devoted to the qualified comparison of the suggested and already existing methods, well founded by analytical and numerical arguments, could be very useful for the readers' decision if to study the methods or not. Probably, the practical users can decide if the suggested approach adequately reflects their problems and their needs, and if the new concepts submitted by the referred book are worth studying.

This point of view can be more decisive for the evaluation of the described theories than the proclamative statements about their philosophical originality.

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