DISEÑO DE SISTEMAS DE AYUDA A LA DECISIÓN CON INCERTIDUMBRE LINGÜÍSTICA



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Introduction

This poster offers a basic scheme of the project TIN2009-07901, which addresses several stages of human decision making, from the observation of reality, information processing to the creation and election of alternatives. Special attention is devoted to representation tools, as far as they help decision maker to understand the decision making problem, and fuzzy uncertainty, since language represents quite often the first and ultimate description of a decision making problem.



About Human Decision Making

The impact in *Computer Sciences* of recent findings in *Neurobiology & Psychology*.

- -Physical structure of the brain
- -Natural reasoning in human decision making
- -The role of language and emotions
- -Information and knowledge representation
- -Management of concepts and their relations

Implied Models and Applications

- 1.- Fuzzy Logic & Symbolic Calculus: Determination of El Quixote's town
- 2.- Aggregation rules & Classification: Remote Sensing
- 3.- Multicriteria DM & Decision Support Systems: Humanitarian Logistics
- 4.- Neural Networks & Mathematical Programming: Learning and Scheduling
- 5.- Reliability Systems & Algorithm Design: Algorithm Verification and Specification

Collaborators

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Decision Stages under Consideration

- 1.- OBSERVATION
 - Logic of the experiment design
- 2.- INFORMATION SYSTEMS
- Datamining and information management techniques 3.- DECISION AID
- Analysis, decomposition, simulation
- 4.- DECISION MAKING
- Generation of alternatives, optimization 5.- QUALITY EVALUATION

Verification, specification

Recent Publications

- H. Bustince, J. Fernández, R. Mesiar, J. Montero: Overlap functions. NON LINEAR ANALYSIS 72:1488-1499 (2010)
- H. Bustince, J. Montero, R. Mesiar: Migrativity of aggregation operators. FUZZY SETS AND SYSTEMS 160:766-777 (2009)
- J. Castro, D. Gómez, J. Tejada: The use of proportional rule applied to durations for slack distribution in a PERT network. EUR. J. OPER. RES. 187:556-570 (2008)
- A. Felipe, M.T. Ortuño, G. Tirado: The Double Traveling Salesman Problem with Multiple Stacks: a Variable Neighbourhood Search Approach. COMPUTERS AND OPERATIONS RESEARCH 36:2983-2993 (2009)
- L. Garmendia, J. Recasens: How to make T-transitive a proximity relation. IEEE TRANSACTIONS ON FUZZY SYSTEMS 17:200-207 (2009)
- D. Gómez, G. Biging, J. Montero: Accuracy statistics for judging soft classification. INT. J. OF REMOTE SENSING 29:693-709 (2008)
- E. Roanes-Lozano, A. Hernando, L..M. Laita, E. Roanes-Macías: A Groebner basesbased approach to backward reasoning in rule based expert systems. ANNALS OF MATHEMATICS AND ARTIFICIAL INTELLIGENCE 5144: 170-183 (2008)
- V. López, M. Santos, J. Montero: Software engineering specification under fuzziness. MULTIPLE-VALUED LOGIC AND SOFT COMP. 15:209-228 (2009)
- J. Montero: The impact of fuzziness in social choice paradoxes. SOFT COMPUTING 12:177-182 (2008)
- J. Montero, D. Ruan: Modelling Uncertainty. INF. SCI. 180:799-802 (2010)
- M.T. Ortuño, B. Vitoriano: A Goal Programming Approach for Farm Planning with Resources Dimensionality. ANNALS OPER. RES. (DOI: 10.1007/s10479-009-0524-5)
- J.T.Rodríguez, B.Vitoriano, J.Montero: A natural-disaster management DSS for humanitarian NGO. KNOWLEDGE BASED SYSTEMS 23:17-22 (2010)
- P.L. Velázquez, R.L.Bracho, J.Ramírez, J.Yáñez: A model for timetabling problems with period spread constraints. J. OPER. RES. SOCIETY 62:217-222 (2010)

Final Comments

Meanwhile key information is given in words associated to natural concepts, fuzzy models should be considered as a complementary tool to Probability in order to deal with uncertainty in human decision making. Such an argument applies to the management of information at every stage, whenever input information is given in linguistic terms or when the output needs to be translated into less technical terms (practical consequences of some mathematical results are sometimes associated to a soft version of such result). But there are also problems that require a conceptual search that may fit into fuzziness, reducing the dimension of characteristic to be taken into account with an acceptable loose of precision. In fact, there are quite a number of *strategic* decision problems that do not require, do not allow, or simply do not pursue relevant precision.

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