1. Background

The aim of the Soft Computing minitrack is fourfold: (i) to summarize past research work in this area and draw lessons from it; (ii) to explore the possibility of developing a new paradigm for modeling, problem solving and decision making; (iii) to suggest an enhanced methodology for incorporating new modeling theory in support systems, and (iv) to develop more effective implementation methods for an effective use of support technology in organizations.

The next generation of modeling tools and support systems will include (but is not limited to) the following:

- fuzzy logic,
- approximate reasoning,
- intelligent agents and filters
- uncertainty modeling,
- multiple criteria decision analysis,
- object-oriented development environments
- neural networks,
- genetic algorithms,

for interactive planning, problem solving and decision making, by individuals or by groups of users. The resulting models will probably be more robust, more adaptive and easier to use than conventional modeling tools. The models will probably be more easily incorporated in support systems. The expected end result is a generation of support systems which provide the users with knowledge-based support which is adapted both to the problems they need to solve and the decision making expected of them and, furthermore, to the internal logic of the context in which they will have to carry out their activities.

The theory of fuzzy logic provides a good mathematical and methodological basis for capturing the uncertainties associated with human cognitive processes, such as identifying causal relationships, thinking and reasoning. The conventional approaches to knowledge representation lack the means for representing the meaning of vague and incompletely understood concepts. As a consequence, the approaches based on first order logic and classical probability theory do not provide appropriate conceptual frameworks for dealing with the representation of the complexities of real world problems and common sense knowledge, since such knowledge is by its nature lexically imprecise, non-categorical and incomplete.

The development of fuzzy logic was motivated - to a large extent - by the need for a conceptual framework which can address the issues of uncertainty, lexical imprecision and incompleteness. Some of the important characteristics of fuzzy logic include:

- exact reasoning is viewed as a limiting case of approximate reasoning;
- everything is a matter of degree;
- knowledge is interpreted as a collection of elastic or fuzzy constraints on a collection of variables;
- inference is viewed as a process of propagation of elastic constraints;
- any logical system can be fuzzified;

There are two key characteristics of fuzzy systems: (i) fuzzy systems are suitable for uncertain or approximate reasoning when systems are difficult to describe with a mathematical model; (ii) fuzzy logic allows problem solving and decision making with incomplete or uncertain information.

2. Expected Shift of Paradigm

The successful use of fuzzy logic in control applications in the last 10-15 years has motivated and initiated work on expanding the use of fuzzy logic in information systems, decision analysis and data mining. This is prompting a shift in paradigm for (i) the design and use of models, (ii) for the use of models in support systems, and (iii) for problem solving and decision making which is relying on models for more effective processes and better results.

The shift in paradigm is also going to introduce new methodologies for modeling and reasoning and for building knowledge based systems to support these processes. We will see more focus on soft computing as a way to get closer to and become more relevant for the complex world of real life problem solving and decision making in real time.
There are efforts under way to promote this shift of paradigm. In Europe the ERUDIT, which is an ESPRIT Network of Excellence, now covers more than 250 active nodes of academic research institutions and industrial partners. The proportion is kept at 60/40 (an academic research institution cannot join unless it brings an industrial partner) and is actively promoting the use of fuzzy logic in information systems, both in their design and development and in the use of information technology in a wide variety of applications. This effort is centered on the ELITE Foundation in Aachen, Germany, but the active nodes come from more than a dozen European countries.

The Berkeley Initiative in Soft Computing (BISC) is a more recent effort. It is organized as a system of Special Interest Groups, which have targeted special areas in which to promote and implement the use of fuzzy logic. Professor Lotfi Zadeh is the organizer of BISC and has laid the theoretical groundwork for soft computing, which is a unifying conceptual framework for efforts to build hybrid systems of intelligent modules, which can be implemented and made useful for a wide variety of applications.

The papers accepted for the minitrack include:


*An Approach to Multiple Attribute Decision Making Based on Incomplete Information on Alternatives*, J. Ma and Z. Fan