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FUZZY SUPPORT SYSTEM FOR NEGOTIATION

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Abstract: Some characteristics of a negotiation support system (NSS) confronted with fuzzy information as well as some considerations on the state of the art in the software application implied are presented. The paper discusses a new attempt to find a method to structure a negotiation process in order to develop an efficient tool for computer-assisted negotiation process. Results from different research fields in order to support the negotiation process are integrated.

1. Introduction

Negotiation means an activity in which participants are motivated both to cooperate and to compete with one another in order to reach one or more desired objectives.

Decision making means to choose an optimal alternative from a set of alternatives. Participants are cooperantly implied in this process.

Often, negotiation or decisional processes participants in are confronted with uncertainty, imprecision or fuzziness.

A negotiation process between conflicting parties could be supported by software applications in which fuzzy models occupy a central place. These tools are considered to be the so-called fuzzy negotiation support systems (FNSS). They offer an analytical assistance for negotiation process in which one is confronted with fuzziness.

This paper describes some critical points in negotiation process and the method to avoid unfeasible negotiation. Also, an improvement of NSS software is proposed.

2. Fuzzy Negotiation Models

As specialists have established, in order to achieve a desired quality of an agreement, the theoretical framework is the so called integrative bargaining model. In this model the negotiators carry out a principled negotiation in which the both sides maximize their objectives. In practice, the integrative bargaining is impeded by analytical difficulties and socio- emotional events. The negotiators' reasoning could

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be improved by providing better rules for negotiations. This may happen when the incomplete, uncertain or imprecise data are included in the negotiation model.

A common set of stages of a negotiation process, modelled as integrative bargaining, is structured as follows (Anson et al. (1990):

I. Pre-session :
A. Pre-negotiation strategy formulation;
B. Agreement to engage in negotiation;
II. Session :
1. Setting the stage:
A. Establishing rules;
B. Developing positive frames;
2. Formulating the problem:
A. Defining the problem;
B. Defining the issues;
3. Processing the issues:
A. Tracking time deadlines;
B. Focusing on specific issues;
C. Role reversal;
D. Paraphrasing;
E. Maintaining equality
4. Resolving the issues
A. Generating alternatives;
B. Analyzing alternatives;
C. Evaluating issues;
D. Developing solutions;
E. Completing the agreement.

From the point of view of the negotiator, the following points : I.A., II.1.A, II.2.A., II.2.B., II.4.B. are critical because of the fuzzy information implied by the negotiation framework. These obstacles could be avoided by considering models from the fuzzy set theory implemented in decision-making problems (Kacprzyk (1983)) and data base problems(Testemale (1984)), also the IA approach (Sycara (1990), Filip (1991)). This ideal framework is called expert fuzzy negotiation support system EFNSS.

The gap between negotiation and decision-making is determined by the difference between these two concepts. This gap between negotiation process and a

peculiar decision-making process becomes smaller if a group decision-making process is implied. The boundary between these two concepts is not crisp. Despite this fact, it is possible to accept and use some modelling gains and characteristics studied and used in each one of these two processes. This approximation seems to make sense taking into account the above structure of negotiation process model.

The conventional decision support system (DSS) corresponds to the conventional negotiation support system (NSS) and, by extension, to the fuzzy negotiation system (FNSS) as a peculiar case. This correspondence is made from the point of view of the structure of these system models. The conventional DSS structure could be used as a basis for the structure of the FNSS as it follows:

- in a FNSS, the data base (DB) and the data base management system (DBMS) become the fuzzy data base (FDB) and fuzzy data base management systems (FDBMS), respectively ; common and fuzzy data coexist.

- the models base (MB) and the models base management system (MBMS) should contain both common and fuzzy models in FNSS.

- the dialogue management system (DMS) should contain fuzzy elements too.

As in the DSS research field, an important objective is to simulate an expert . The framework for an expert negotiator in for FNSS (EFNSS) could be modelled from that one of an expert DSS (EDSS) as it follows:

- two or more negotiators with or without mediators;
- the data base and the data base management system;
- the model base and the model base management system;
- the interface;
- the report generator;
- the visual display;
- the knowledge base including the domain and tools expertize.

In this framework accepted for EFNSS, the heart is the knowledge base, in which the case-based reasoning (CBR) technique plays an important role.

A negotiator can use CBR in a variety of tasks such as:

- recommendation of a package settlement;
- justification of recomandations;
- exploration of feasible alternatives;
- approximation of utilities of the parties;
- discovery of solutions in exceptional circumstances;
- modification of a rejected compromise;

as suggested by Sycara(1990). The aim of this technique is to model the dynamics of negotiation, i.e., the gradual modification of negotiating positions, the gradual shift in the negotiators' perceptions, and the incorporation of new and/or changing information.

Considering all these structures and their logical links as a minimal methodology, a negotiator could construct a efficient NSS for his task.

3. Suggestions for NSS Software Improvements

The existing software for negotiation processes does not emphasize on the possible inclusion of fuzzy aspects and does not attempt to include them. That is why we propose a necessary improvement of the existing NSS software such as: COMPUTER DECISION TREE MODEL, DECISION ANALYSIS, DECISION MAKER, DTG- ANALYTICAL MEDIATION, MEDIATOR, NEGO, POLICY PC, RUNE, PERSUADER.

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