Chapter 65

Quantitative Concession Behavior Analysis and Prediction for Decision Support in Electronic Negotiations

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ABSTRACT

Quantitative analysis of negotiation concession behavior is performed based on empirical data with the purpose of providing simple and intuitive decision support in electronic negotiations. Previous work on non-linear concave preferences and subsequent concession crossover provides a theoretical basis for the model. The authors propose a model which quantifies the remaining concession potential for each issue and a generalization of the model which permits the memory/decay of past concessions. These models permit the analysis of negotiators' concession behavior. Using the proposed models, it was possible to quantitatively determine that negotiators in the authors' negotiation case exhibit concession crossover issues and thus have a tendency to give concessions on issues with the most remaining concession potential. This finding provides empirical evidence of concession crossover in actual concessions and the corresponding model permits the design of a simple and intuitive prediction methodology, which could be used in real world negotiations by decision support systems or automated negotiation agents.

1. INTRODUCTION

Negotiations are an important type of exchange mechanism. Multi-issue negotiations allow the participants to look for mutually acceptable agreements in an integrative fashion (Kersten & Noronha, 1999). This is due to the fact that parties may, in general, have different preferences over the issues. Involving multiple issues in the solution search process allows the parties to find agreements that might not have been possible in single-issue "distributive" negotiations (e.g. involving only price). The participant preferences could be defined in regards to the different levels/options per an issue, as well as overall importance of any given issue.

Typically each party's preferences are kept private making solution search turn into an offer exchange process. This makes negotiations more complex as the parties involved have to "maneuver" while making concessions on various issues, while trying to understand the other party's preferences. With a larger number of issues the number of potential alternative offers explodes and the human negotiators may not be making fully rational decisions. Moreover, the process itself becomes cognitively and emotionally challenging and it requires significant time commitment.

Therefore, various tools for alleviating negotiation efforts have been proposed in the past. Having evolved from negotiation support systems (Jelassi & Foroughi, 1989), modern electronic negotiation support tools can help the parties in the pre-negotiation (e.g. preference elicitation), negotiation (e.g. offer evaluation), and post-negotiation (e.g. checking agreement for Pareto-optimality) phases (Kersten & Noronha, 1999). Software agents, when employed, can take more proactive roles in the process. For example, they could act as assistants (Chen, Vahidov, & Kersten, 2005; Vahidov, Chen, & Kersten, 2014), or they can completely automate the negotiation process

(Beam & Segev, 1997; Jennings & Faratin, 2001; Sánchez-Anguix, Valero, Julián, Botti, & García-Fornes, 2013). In either case insights about the other party's preferences, behaviors, as well as the ability to predict the opponent's moves may help the negotiator (human or agent) to better assess the opponent and plan offers accordingly.

Previous work has proposed the existence of non-linear concave preferences and subsequent effects such as concession crossover (Northcraft, Brodt, & Neale, 1995). This occurs when the initial concessions on a negotiation issue do not reduce the conceder's utility by much, but each subsequent concession on the same issue causes an increasingly greater reduction on the conceder's utility. Inversely the first concessions have a sizeable positive impact on the counterpart's utility, but each subsequent concession has an increasingly lesser positive impact.

The purpose of this paper is to develop quantitative models and methods to further our understanding of concession behaviors and to investigate the feasibility of applying simple intuitive approaches to predicting negotiation opponent moves. Equipped with such a decision support tool humans or automated negotiators can assess the feasibility of an agreement, and can plan their actions accordingly. We are assuming minimal knowledge for our models. Thus, no explicit knowledge of the opponent's preferences is given, only past explicit offers are accessible to the analysis. In fact, it is not known if the given opponent is human or agent. As humans may make only a limited number of offers the method has to be able to start giving predictions even after a first couple of offers from the opponent.

2. BACKGROUND

As mentioned in the previous section, the need for alleviating cognitive efforts in negotiations

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