

Demonstration of a Software System for Automated Multi-Attribute Negotiation

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1. Overview of the proposed system

Negotiations have been identified as a key form of interaction in multi-agent systems. Multi-attribute negotiations are of particular interest, since in such cases outcomes that bring utility gains for both parties are possible. Our fundamental research [1,2] aims at bridging the gap between negotiation theory and human negotiation practice and to construct answers to open challenges (e.g., how to handle incomplete preference information). Based on this theoretical foundation, a software environment was developed to enable better understanding and testing of the model (this was originally presented as [3]).

The considered type of negotiation follows an alternating-offers protocol; a bid has the form of values assigned to a number of attributes. If the negotiation is about a car, for example, the relevant attributes considered are CD player, Extra Speakers, Airco, Tow Hedge, Price, and a bid consists of an indication of which CD player is meant, which extra speakers, airco and tow hedge, and what the price of the offer is. The proposed demonstration is based on this domain, and was originally developed in collaboration with Dutch Telecom KPN. However, the negotiation model presented in [1] and [2] is a generic one and instantiations in other domains are possible. In both cases, the DESIRE software environment (developed at Vrije Universiteit, Amsterdam) was

used to design and (automatically) implement the agents. The system supports 3 types of negotiation (all of which can be shown during the demonstration): human vs. human negotiation, human vs. software agent and software agent vs. software agent.

2. Purpose of the Demonstration

There are several aims that we wish to achieve in our demonstration. The first aim is to show how incomplete preference information can be used to increase the efficiency of the joint exploration of the utility space. The method used to achieve this is to compare the traces produced by two negotiations: a perfectly closed negotiation with no guessing and one where some profile info (in the form of one or several preference weights) and/or guessing is used (see [1] for a description).

The second important aim is to show how humans can use such a system to negotiate both against other humans or software agents. This is significant, because it gives us the possibility to analyze the behaviour of humans in complex negotiations over multiple attributes and in the presence of uncertain information. This may hold important clues for the design of future automated trading mechanisms.

Finally, the system can also be used as a training tool for introducing human negotiators into the complexities of multi-attribute utility theory (described in the classical work by Howard Raiffa and others). In this educational capacity, our software may be useful both to students, as well as professionals outside the academic field.

References

- [1] Jonker, C., Robu, V. – “Automated Multi-Attribute Negotiation with Efficient Use of Incomplete Preference Information”, accepted as full paper at the *Third International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2004)*, New York, 2004.
- [2] Jonker, C.M., Treur, J., “An Agent Architecture for Multi-Attribute Negotiation”. In: B. Nebel (ed.), *Proc. of the 17th International Joint Conference on AI, IJCAI'01*, 2001, pp.1195 - 1201.
- [3] Jonker, C., van der Meij, L., Robu, V., Treur, J. – “Demonstration of a Software System for Automated Multi-Attribute Negotiation”, accepted demonstration at the *Third International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2004)*, New York, 2004.