Chapter VI R²-IBN: Argumentation Based Negotiation Framework for MAIS-E² Model

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ABSTRACT

In the age of information proliferation, openness, open information management, **interconnectivity**, **collaboration** and communication advances, **extended enterprises** must be up to date to the new strategic, economic and organizational structures. Consequently, intelligent software based on **agent** technology emerges to improve system design, and to increase enterprise competitive position as well. The competitiveness is based on the information management, **cooperation**, **collaboration** and **interconnectivity**. Thus, within these **interconnectivity** and **cooperation**, conflicts may arise. The automated negotiation plays a key role to look for a common agreement. Argumentation theory has become an important topic in the field of **Multi-Agent Systems** and especially in the negotiation problem. In this chapter, first, the proposed model **MAIS-E**² (Multi-**Agent** Information System for an **Extended Enterprise**) is presented. Then an **argumentation based negotiation** framework: Relationship-Role and Interest Based **Negotiation** (**R**²-**IBN**) framework is presented, and within this framework, the authors focused mainly on, argument generation module via inference rules and argument selection module via **fuzzy logic**.

INTRODUCTION

Nowadays, a number of new concepts have been proposed, e.g., Virtual Organization, Supply Chain Management, Virtual and Extended Enterprise, etc (Tsung-Yi, 2008; Martinez, Fouletier, Park & Favrel, 2001). An extended enterprise is the cooperation, collaboration and interconnectivity of legally independent enterprises, institutions, or individuals. The extended enterprise will be characterized by intensively concurrent engineering based on open information both in management and technologies such as digitalization, computer network, and artificial intelligence (Tsung-Yi, 2008). The intelligent software agent technology provides a natural way to overcome such problems (Martinez, Fouletier, Park & Favrel, 2001). Agents help to capture individual interests, local decision making using incomplete information, autonomy, responsiveness, robustness, modular and distributed. A Multi-Agent System (MAS), as a society of autonomous agents, is an inherently open and distributed system. It is made up of a group of agents combined with each other to solve a common problem cooperatively. In addition, negotiation is a key form of interaction in systems composed of multiple autonomous agents (Bench-Capon & Dunne, 2007). The automated negotiation plays a key role in sharing information and resources to look for a common agreement. The research literature proves that Argumentation Based Negotiation (ABN) is an effective means of resolving conflicts in MAS (Bench-Capon & Dunne, 2007; Hsairi, Ghédira, Alimi & Ben Abdelhafid, 2008). Besides, the fuzzy logic of Zadeh (1965) opens new horizons in the vast world of information analysis and treatment. One of the present tendencies in the fuzzy modeling is generating models that take into consideration two fundamental conditions at the same time: interpretability (which is the description capacity of the modeled systems behavior) precision and fidelity of model towards the original system (Casillas, Cordòn, Herrera & Magdalena, 2003).

In this chapter, in the first place, we present our research efforts in developing a **MAS** architecture named **Multi-Agent** Information Systems for an **Extended Enterprise** (**MAIS-E**²). Then, we define the Relationship-Role and Interest Based Negotiation (\mathbb{R}^2 -IBN) framework. \mathbb{R}^2 -IBN framework is an extension of an existing one namely IBN (Rahwan, Sonenberg & Dignum, 2004). In this chapter, we present mainly the extensions made in two modules: the argument generation module via inference rules and argument selection module via **fuzzy** rules based system as an intelligent method in order to better estimate the desirability degree of the argument to send.

The remainder of this chapter is structured as follows: the *background* section describes **extended enterprises**, reviews **negotiation** approaches and related works. The *MAIS-E²: An Intelligent Model Toward An Inter-Enterprise Cooperation* section presents our research efforts and experiences in developing a **multi-agent** model for an **Extended Enterprise**. The *R²-IBN: Argumentation Framework* section describes our proposed **argumentation based negotiation** framework. *Future Trends* section presents emerging tendencies. Finally, in the *conclusion* section remarks and perspectives are given.

BACKGROUND

In this section, we first describe **extended enterprises**, then, we review **negotiation** approaches and finally, we review related works.

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