Chapter VII

Using Semantic Web to Facilitate Agent-to-Agent Argumentation for E-Commerce

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Abstract

This chapter designs a multi-agent argumentation system for e-commerce. This system applies Semantic Web technology to facilitate agents to share ontologies and describe their own mental states and arguments. All arguments are connected by attacking relations and can be proved or defeated via a dialectical game. In this system, buyer and seller agents can understand arguments and argue over product attributes. This system can help buyers to delegate their buyer agents to search products that exactly match their needs, and help sellers to delegate seller agents to present products and persuade buyer agents into believing that the products can satisfy the buyers’ needs.

Introduction

Many efforts have been spent on supporting automated commerce activities on the Internet, such as selling, searching, auction, and payment. Agent technologies have been used for reaching a certain level of autonomy to release human’s cognition and...
manual loads. For example, many e-marketplaces provide search agents to help buyers to search products that match their preferences and provide comparison agents to help buyers to compare products and make purchasing decisions, for example, mySimon.com and Bizrate.com. Additionally, many intelligent bargaining agents for e-marketplace have been researched (Matwin, Szapiro, & Haigh, 1991; Oliver, 1997; Wasfy & Hosni, 1998; Zeng & Sycara, 1998; Lin & Chang, 2001; Dumas, Governatori, Hofstede, & Oaks, 2002; Huang & Lin, 2005). However, to enable agents with the semantic argumentation ability is still a trial due to many obstacles.

The first obstacle is how to enable a buyer agent to understand product descriptions presented by a seller agent. Semantic Web enables Web information to be machine-understandable and facilitates agents to understand information. It seems that Semantic Web can transcend this obstacle. Although current Semantic Web can tolerate information contradiction, it only supports monotonic reasoning that new information cannot retract previous information, and facts and entailments can only be added but never defeated. In a used-car e-marketplace, for example, a buyer delegates a buyer agent to find out good-condition cars. In this case, the buyer and sellers may have different definitions of the concept of “good-condition car.” Therefore, the second obstacle is how to issue arguments between agents to prove or disprove the counterpart’s proposition.

Argumentation in a multi-agent context is a process by which one agent attempts to convince another agent of the truth (or falsity) of state of affairs. This process involves agents putting forward arguments for and against propositions, together with justifications for the acceptability of these arguments (Wooldridge, 2002). In an argumentation process, a truth can be defeated when new information appears. Through argumentation, following the above example, a seller agent can persuade a buyer agent to believe its car is in a good condition even both have different definitions for a good-condition car. To facilitate multi-agent argumentation, a defeasible reasoning approach can be developed upon the Semantic Web.

This study aims to design a multi-agent e-marketplace, in which buyer and seller agents can argue over product attributes via argumentation. This study adopts OWL, a Web ontology language, to clearly express arguments and uses a dialectical game approach to support defeasible reasoning. Using this system, a buyer can delegate a buyer agent to search products that exactly match his/her need, and a seller can delegate a seller agent to present products and persuade buyer agents into believing that the products can satisfy their masters’ needs.

The rest of this chapter is structured as follows. The next section describes the related works about Semantic Web, existing matchmaking platforms that use Semantic Web technology, and defeasible reasoning for argumentation. Then, we design the multi-agent argumentation system using Semantic Web and defeasible reasoning, and illustrate the architecture of this system. Finally, we conclude this study and indicate future directions.
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