Chapter 17

Negotiation by Software Agents in Electronic Business: An Example of Hybrid Negotiation

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ABSTRACT

Electronic negotiation is one of many applications that software agents can perform to facilitate electronic business. Negotiations between software agents and humans (hybrid negotiation), can make electronic business efficient and intelligent. It can save time, effort and other valuable resources by replacing the human in electronic business activities and many other domains. However, to enable hybrid negotiation, a software agent needs clear machine interpretable semantics to understand and generate natural language content. Although it is not simple to make natural language content understandable by software agents as a whole, it can be achieved in different domains—in this case electronic business. For this purpose, an example of hybrid negotiation is presented, in which a software agent and a human agent negotiate for a business contract. Problems involved in this negotiation process are partially resolved through ontologies (the main Semantic Web technology), NSS (negotiation support system) and hand written rules.

INTRODUCTION

Electronic business performs using the Web as a platform. The ubiquity of the Web has made its evolution fast that we need new business models and technologies for electronic business to perform efficiently. The current Web is challenge for businesses to attract new customers while retaining existing customers as well as for consumers to search optimal solutions within time. The Semantic Web is a promising solution for challenges to the current Web (Berners-Lee, Lassila, & Hendler, 2001). Software agents (operating on Semantic Web) are valuable support to meet the changing demands of electronic business. The Semantic Web and software agents together can become
supporting business entities to boost electronic business performance. However, the Semantic Web is facing criticism of being an overestimation, as AI (Artificial Intelligence) has faced for a long time. This huge ambitious aim has a slow progress due to a "chicken and egg problem." Markups are required before developers start building smart applications; applications are required before it is worth the hard work of doing markup (Pell, 2007). By providing intelligent applications in electronic business, the Semantic Web and software agent will cash benefit to attract the research communities that will involve the Semantic Web and its technologies to other applications. The whole process will gradually evolve the current Web (web of documents) to the Semantic Web (web of data).

Objectives of the chapter include describing the significance of the Semantic Web and software agents for electronic business, discussion on the negotiation process by software agents in electronic business, and an elaboration of hybrid negotiation through an example. In the end, we discuss in detail the issues and their solutions in enabling hybrid negotiation.

BACKGROUND

The Web has rapidly progressed since its start. The Internet System Consortium advertised nearly 100 million hosts on DNS in January 2000. In January 2012, the amount has increased to 1 billion, and each host maintains from tens to millions of webpages (www.isc.org). Human limited ability is a resistance to search the information of interest from this massive collection. The thousands of webpages come as result against a search query. Because main search tools for today’s web such as Yahoo and Google are Keyword-based (Antoniou & Harmelen, 2008). Many problems occur with keyword based searches including “high recall, low precision”, “low or no recall,” among others. Moreover, results are single webpages, in the case when information is spread over various documents and a separate query is needed to access each document. A human user cannot screen all the webpages to choose a page containing the required content. Machines can be involved for a solution; obviously, machines can process millions of pages within seconds. But the question is, how do machines behave like they understand Web content (Chou, 2007)? Most of today’s Web content is only appropriate for human utilization (Antoniou & Harmelen, 2008). An alternative approach is to represent the Web content in a form that is machine-processable and to use intelligent techniques (e.g., intelligent agents) to take advantage of these representations. This plan of revolutionizing the Web is the Semantic Web initiative (Antoniou & Harmelen, 2008).

The real worth of the Semantic Web is that it is machine interpretable and uses intelligent tools and software agents to assist humans. The Semantic Web will explore the collaboration of humans through software agents and automated Web services (Chou, 2007). Antoniou and Harmelen (2008) provide an outlook for how software agents in the Semantic Web will support humans in the future. In this vision, a person, Michael, who had a minor car accident, wants to take physical therapy sessions. Michael assigns his Semantic Web agent to find out a few suitable opportunities. The agent gets him an appointment for a therapist, maintained by Michael’s health insurance company, and is near his office and not disturbing his busy schedule. In another case study, Berners-Lee, Lassila, and Hendler (2001) gave an illusion that a brother “Pete” and sister “Luce,” manage a doctor’s appointment for their mother. They get the appointment organized by their software agents according to the given preferences, suitable time, and nearest path. Their agents manage it by cooperating with each other and communicating with the doctor’s agent. A vision yet, but going to meet now, as agents have started providing...