A Systemic Approach to Define Agents

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Software agent is a very popular topic in computer science in the past few years. One of the promising applications of agent technology is shown in web applications. A tool for understanding, structuring, and defining agents becomes very important in order to release the power of this revolutionizing concept. This article surveys the definitions of agents and proposes an agent definition framework in the light of the Soft Systems Methodology to understand, define and model agents systematically.

INTRODUCTION

Software agent is a rapidly developing area of research and the term ‘agent’ has become a popular buzzword in computer science in recent few years. On the other hand, Internet undoubtedly changes enormously the way of living for many of us. In business, it transforms radically the ways of doing business. In the near future, it is anticipated that many businesses would benefit from this new technology. For example, according to eMarketer (http://www.e-land.com/estats/100499_jupiter.html), the online brokerage sector will see tremendous growth in assets, from $415 billion in 1998 to over $3 trillion by the end of 2003.

More recently, there are some attempts to apply agent technology to various areas including those involved in electronic commerce. (For further information, a survey can be found in Guttman, Moukas and Maes (1998). Particularly, we observe that agents are being defined to act as buyers and sellers and to commu-
nicate and negotiate with each other autonomously or semi-autonomously, as in Moukas, Gutman, Zacharia and Maes (1999), Gutman et. al. (1998), Gutman and Maes (1998), Terpsidis, Moukas, Pergioudakis, Doukidis and Maes (1997), and Chavez and Maes (1996). In essence, agents are defined to represent electronic commerce components.

As such, it is important to research into the definition of agents. Our view is that what is required is a systematic approach of defining an agent structurally in a problem situation, particularly within an electronic commerce environment. More specifically, in the process of defining an agent, we need to have an understanding of what we mean by “agent.” Unfortunately, “there is no real agreement even on the core question of exactly what an agent is” (Jennings, Sycara & Wooldridge, 1998). Many researchers discuss about their definitions, for example, see Wooldridge and Jennings (1995), Russell and Norvig (1995), Fagin, Halpern, Moses and Vardi (1995), Franklin and Graesser (1996), Gilbert (1997), Huhns & Singh (1998), Jennings and Wooldridge (1998), and Jennings et. al. (1998). We therefore suggest that a good understanding on agent concepts provides a powerful repertoire of concepts and tools to improve the way in which people conceptualize many types of software. We claim that the SSM is a good tool to understand and hence define agents.

One of the most common attempts to understand agent concepts is by borrowing object oriented (OO) concepts. A further discussion can be found in Jennings et. al. (1998). The use of this approach shows a conceptual misunderstanding. Agent developers misunderstand that an agent is simply a specific type of objects. As a result, some key characteristics, such as autonomy, adaptability, etc. of agents are not captured. Wooldridge et. al. (1999) commented similarly that “there is a fundamental mismatch between the concepts used by object-oriented developers ... and the agent-oriented view.”

Our aim in this chapter is to establish a methodological framework for the defining agents. We propose the adoption of the well-known Soft Systems Methodology (SSM) as a tool for understanding and defining agents that sufficiently delineates the major characteristics of agents by analyzing and structuring the problem situation, naming and defining the problem, and then eventually specifying the system. We first investigate and identify the central characteristics of agents by reviewing 12 definitions from the literature. Then we apply SSM to define agents by structuring the involved problem to cover the central characteristics of agents. Using this approach, we may avoid such fundamental mismatch between agent and the borrowed object oriented concepts (Jennings et al., 1998).

WHAT IS AN AGENT?

The development of agent technology is ongoing, and thus there are many answers to the question “what is an agent?” We reviewed 12 definitions of agents
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