Chapter 10
Enhanced Reputation Model with Forgiveness for E-Business Agents

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ABSTRACT

Trust is a very important quality attribute of an e-service. In particular, the increasing complexity of the e-business environment requires the development of new computational models of trust and reputation for e-business agents. In this paper, the authors introduce a new reputation model for agents engaged in e-business transactions. The model enhances classic reputation models by the addition of forgiveness factor and the use of new sources of reputation information based on agents groups. The paper proposes an improvement of this model by employing the recent con-resistance concept. Finally, the authors show how the model can be used in an agent-based market environment where trusted buyer and seller agents meet, negotiate, and transact multi-issue e-business contracts. The system was implemented using JADE multi-agent platform and initially evaluated on a sample set of scenarios. The paper introduces the design and implementation of the agent-based system together with the experimental scenarios and results.

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INTRODUCTION

Reputation is one of the important concepts that help to make more informed and intelligent decisions for selection of partners in e-business transactions (Chang, Hussain, & Dillon, 2006). In a digital economy populated with a multitude of electronic services, participants to the global electronic market, usually buyers and sellers are represented using software agents (Fasli, 2007). Similarly to human society, an agent will agree to engage in a new business relation governed by a set of contractual terms and conditions, only with reputable business partners. This means that, if an agent has a good reputation in a society of agents, other agents will decide to select him for engaging together in future business transactions.

Closely related to reputation is the concept of trust. Successful e-businesses are usually based on creation and maintenance of a solid trust relationship with their potential customers over a period of time (Srinivasan, 2004). Trust is a complex concept that has a multitude of facets. Although there is no full agreement on its definitions, trust can be understood as a subjective measure of an agent’s belief in another agent’s capabilities, honesty and reliability based on its own direct experiences (one-to-one relationship), while reputation can be understood as an objective measure of an agent’s belief in another agent’s capabilities, honesty and reliability based on recommendations received from other agents (one-to-many relationship) (Badica et al., 2006).

So, in order to clarify the terminology, given two agents $a$ and $b$, we shall talk about reputation of agent $a$ for agent $b$ as the measure of the degree of $b$’s belief in the capability, honesty and reliability of agent $a$. We shall denote this value with $R_{b,a}$. Usually in such a relation, agent $a$ is said to have trusted role, while agent $b$ is said to have trusting role (Jøsang, Ismail, & Boyd, 2007). Note that, according to this view of the reputation, parameters $a$ and $b$ can represent singleton agents, as well as groups of agents.

Distinction between trusting and trusted roles in a business relation points out to the two facets of the trust-reputation dichotomy. According to the reputation facet, we can talk about the reputation of agent $a$ as seen by agent $b$, while according to the trust facet we can talk about the trust developed by agent $b$ in agent $a$. In this paper we only consider the concept of reputation, as we believe that this concept is more appropriate to e-business domain. Intuitively, reputation can be used to qualitatively characterize a given business, as well as reputation is closer to frequently encountered marketing concepts like brand and image (Jøsang, Keser, & Dimitrakos, 2005).

Traditionally, reputation is evaluated by collecting feedback during history of previous interactions between business partners (Badica et al., 2006; Ganzha et al., 2006). There are many approaches for modeling and evaluation of reputation in agent systems, ranging from simple rating methods to more complex mathematical models based on graphs or sophisticated uncertainty or logic models (see the following survey papers (Sabater & Sierra, 2005; Wang & Lin, 2008; Jøsang, Ismail, & Boyd, 2007).

In our proposal we model e-business as a semi-competitive environment where agents will have to decide if to engage or not in e-business transactions with a given partner (Foued et al., 2009). Their decision is taken based on reputation of the potential partners, i.e., the higher partner’s reputation is then the higher is considered the agent’s utility (i.e., the agent will benefit more) by engaging with that partner.

In our model we consider that agents are grouped into “societies”. We consider two societies: buyer society and seller society. With respect to these two societies, following the initial proposal of (Foued et al., 2009), depending on the sources of information that we can use for computing reputation, we define four types of reputation: (i) direct reputation of a given seller for a given buyer; (ii) direct reputation of a given buyer for
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