Chapter 5
Enhancing Social Networks with Agent and Semantic Web Technologies

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ABSTRACT

In this chapter, the authors describe the relationships between multi-agent systems, social networks, and the Semantic Web within collaborative work; they also review how the integration of multi-agent systems and Semantic Web technologies and techniques can be used to enhance social networks at all scales. The chapter first provides a review of relevant work on the application of agent-based models and abstractions to the key ingredients of our work: collaborative systems, the Semantic Web, and social networks. Then, the chapter discusses the reasons current multi-agent systems and their foreseen evolution might be a fundamental means for the realization of the future Semantic Social Networks. Finally, some conclusions are drawn.

INTRODUCTION

In recent years we have witnessed a huge diffusion of social networking Web sites that have quickly become an unprecedented cultural phenomenon (Boyd & Ellison, 2008). Such Web sites have attracted users with very weak interests in tech-

nology and some of the largest ones constitute a separate, closed and parallel Internet-scale network.

Social Networking Sites (SNSs) allow members to publish personal information in a semi-structured form and to define links to other members with whom they have relationships of various kinds. These relationships are usually suggested by the system that governs the SNS. In order

to suggest possible acquaintances, the system analyses every piece of information provided by the users, e.g., their posts, their profiles and the queries they made. The information is used to infer real-life acquaintances and possible new friendships taking into account shared features like common interests and friends.

The huge amount of extremely sparse and heterogeneous users' data requires an integrated, aggregated and fused approach to the realization of SNSs capable of simplifying users' interactions. The Semantic Web indeed provides a conceptual framework, which is definitely ideal to fulfill such needs. The evolution of SNSs is therefore expected to heavily rely on the use of Semantic Web technologies, like ontologies, to publish members' information and to manage social connections (Mika, 2005; Breslin & Decker, 2007). Moreover, there is a trend of integration among different SNSs (Blue, 2009; Grossberg, 2007; Osterloh, 2010), which makes imperative the adoption of technologies capable of lifting such complex integrations from purely syntactic to fully semantic. Such technologies would then enable richer forms of integration among SNSs that would go far beyond the simple match of profiles and that would provide a truly integrated view of different profiles in different networks.

Needless to say, we are already experiencing the introduction of Semantic Web technologies in existing SNSs. For example, some of the most important social networking platforms already adopted RDF (Manola, Miller & Mc Bride, 2004) and we expect more to follow (Facebook, 2010). However, the very strict privacy and trust concerns that naturally arise in relation to the increased automatic processing features that Semantic Web technologies provide should also be taken into serious account. Private companies own most actual SNSs and the main revenue of such companies comes from advertisements, which can be far more effective if precisely targeting well-identified groups of users. The identification of such groups requires the automatic process-

ing of sensitive data and therefore it is subject to local government laws and regulations that call for specific and well-defined treatment methods (Bergenti, 2008).

In previous works we have already studied how Agent and Semantic Web technologies may become a key factor of future SNSs mainly from an implementation point of view (Franchi, 2010; Bergenti, Franchi & Poggi, 2010; Franchi & Poggi, 2011). On the contrary, in the present work, we focus on how social networks are important for the adoption and evolution of the Semantic Web research itself.

The models and abstractions of social networks are applicable every time a system manages a collection of individuals with some relationships. The systems implementing SNSs can be used to perform and optimize queries and to associate a level of trust to the answers, considering the referrals that led to the answering agent. For example, SNSs are crucial for the realization of a web of trust that enables the estimation of information credibility and trustworthiness (Sabater & Sierra, 2002). This is the case of systems where agents often interact with unknown parties and need to establish the trustworthiness of the parties themselves. The use of a SNS increases the capability to compute the reputation of the parties considering also the past experiences of his/her acquaintances. The judgment is likely to be unbiased since the short length of paths makes manipulation very hard, and it also increases the likelihood to find a possible known trustworthy party that would ground the judgment.

Another possible use of the abstractions at the heart of social networks is in the construction of ontologies and folksonomies (Van Damme, Hepp & Siorpaes, 2007). The analysis of the social connections among the members of a community can be helpful in finding relationships among concepts of an ontology, or tags of a folksonomy, that model the information shared in the community.

Social networks have a very close relationship also with *Multi-Agent Systems (MASs)*. MASs

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