Position Statement

Intelligent Agents and P2P Semantic Web

Mehmet A. Orgun

Department of Computing, Macquarie University, Sydney, NSW 2109, Australia
E-mail: mehmet@comp.mq.edu.au

The Semantic Web aims to address the limitations of the World Wide Web by providing content that can be interpreted by both humans and machines, thus enabling intelligent agents acting on behalf of humans and/or other agents to discover and reason with the available information [1]. While there has been tremendous progress on the infrastructure development for the Semantic Web, it has been observed that comparable progress in the use of the agent technology is still lacking [2]. In the mean time, Peer-to-Peer (P2P) networks have been very successful by making available and redistributing huge amounts of data among millions of networked computers. This naturally leads to the concept of a distributed Semantic Web archive integrated with the existing Semantic Web that resides on a P2P network of user nodes (hence so-called P2P Semantic Web).

An early vision of P2P Semantic Web was restricted in functionality to providing a distributed environment that allows sharing of independently created and maintained ontologies [3]. We envision P2P Semantic Web aimed at using P2P technologies in order to preserve and provide access to varieties of digital information on P2P networks. P2P Semantic Web decentralizes digital information from its owner (with permission if necessary) and makes all of its versions available by sharing and storing them across an enormous, constantly accessible and loosely coupled distributed archive [4].

P2P Semantic Web creates new challenges for the agent technology. For example, autonomic behaviour is seen as essential for intelligent agents operating in an uncertain and volatile decentralized P2P network to facilitate error recovery [5]. Context awareness is also essential since information available to an agent on P2P Semantic Web may depend on peer location and available resources (including time and processing power). The distributed and versioned nature of digital archives with frequent updates supports the retrieval of information from P2P Semantic Web even when it is not available at its source subject to service quality, network dynamics, metadata availability and the agent capability. Agent reputation, trust and security issues (such as securing agents from malicious peers as well as other agents, and vice versa) also require full attention.

Our proposal offers splendid opportunities for leveraging the interplay between the agent technology and the Semantic Web to facilitate further the engineering of intelligent agents operating in P2P Semantic Web.

References

[1] T. Berners-Lee, J. Hendler, and O. Lassila, "The Semantic Web: A New Form of Web Content that Is Meaningful to Computers Will Unleash a Revolution of New Possibilities," *Scientific American*, May 2001, pp. 28–37.

[2] J. Hendler, "Where are all the agents (long form)," http://www.mindswap.org/blog/2007/04/23/where-are-all-the-agents-long-form/ (last accessed 16 May 2007)

[3] M. Arumugam, A. Sheth, and I. B. Arpinar, "Towards Peer-to-Peer Semantic Web: A Distributed Environment for Sharing Semantic Knowledge on the Web" *WWW2002 Workshop on Real World RDF and Semantic Web Applications*, Honolulu, Hawaii, May 7, 2002.

[4] C. Mantratzis and M. A. Orgun; A Peer2Peer World Wide Web Concept for the Broadband Enabled User Community, In *Proc. of the 2004 ACM Workshop on Next-Generation Residential Broadband Challenges*, October 15, 2004, New York, NY, USA, ACM, pp.42-49.

[5] V. Tamma, I. Blacoe, B. L. Smith, and M.Wooldridge, "Introducing autonomic behaviour in semantic web agents", *In Proc. of the Fourth International Semantic Web Conference (ISWC 2005)*, Galway, Ireland, November 2005.