

Exploring Intelligence of Web Communities

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ABSTRACT

Web Intelligence is a multidisciplinary area dealing with utilizing data and services over the Web, to create new data and services using Information and Communication Technologies (ICT) and Intelligent techniques. The link to Networking and Web Communities (WCs) is apparent: the Web is a set of nodes, providing and consuming data and services; the permanent or temporary ties and exchanges in-between these nodes build the virtual communities; and the ICT and intelligent techniques influence the modeling and the processes, and it automates (or semi-automate) communication and cooperation. In this paper, we will explore one aspect of (Web) intelligence pertinent to the Web Communities. The “intelligent” features may emerge in a Web community from interactions and knowledge-transmissions between the community members. We will also introduce the WI&C’14 workshop’s goal and structure.

Categories and Subject Descriptors

I.2.11 [Artificial Intelligence]: Distributed Artificial Intelligence - intelligent agents, multi-agent systems

Keywords

Web intelligence, web communities, ICT, knowledge, social networks

1. INTRODUCTION

In recent years, the concept of (artificial) intelligence has been widely discussed from various aspects. This research field gave a way to the development of ever smarter approaches to extract patterns and build knowledge with the aid of artificial intelligence techniques. These techniques have been used, together with information technology, in a wide range of applications. This is where knowledge representation, reasoning, semantics, social network analysis, web structure, content, usage, and other aspects have been and will increasingly keep being included in many application domains.

The World Wide Web (WWW) provides rich medium for communication, which goes far beyond the conventional communication media. To keep up-to-date in the research areas of Web Intelligence & Communities is vital to further contribute

towards the understanding of how the intelligence play role in Web based communities. This is the goal of the WI&C workshop.

A *community* refers to a group in which the members have some common characteristics or share some interests; for instance, it can be formed around the people who have similar hobbies, who share specific literary interests, or who participate in a similar business debate. Such communities are playing an increasingly important role on the Web. Notably, accompany with the upsurge of the World Wide Web is the rapid growth of the different categories of Web-based communities or virtual communities (Rheingold 2000), and the collective pursuits of those web communities often manifest high problem-solving capabilities. For example, in the Open Source Software drive, a loosely-connected community of developers who do not even know each other can jointly develop complex software products such as the Linux operating system. Therefore, the exploration of intelligence pertinent to community is certainly of practical importance.

With the support of the information and communication technologies (ICT), the online communities exhibit higher intelligent features than a traditional community does since ICT firstly provides an effective communication channel for massive exchange of data, information and knowledge and secondly the computation capabilities of the modern ICT may be of great help for the information processing tasks with the entire community.

In a Web community, various ICT technologies that may be branded as Web intelligence play a critical role to support the collective (human) intelligence of that community. In this sense, intelligence of web community is the blended intelligence of Nature-inspired Intelligence and Machine Intelligence. Intelligence was traditionally considered as the problem-solving capabilities of living creatures, in particular of human beings. We term this type of intelligence as “Nature-inspired Intelligence”, in contrast to the intelligence exhibited by machines.

A Web community can self-grow to have as a minimum three crucial characteristics. First, the community should, largely in a distributed fashion, contain a memory system that stores shared information and knowledge, analogous to the memory system in a human brain. Second, the community should have the capability of “intelligent” problem-solving, i.e. the capability of exploiting the gathered knowledge to solve problems; and the community should demonstrate higher-level intelligent capability than any community member *per se*. Finally, the memory system should dynamically evolve, similar to the cognitive learning progress of a human mind.

Comparing to the human brain which is encompassed in the interconnected neurons, the community intelligence can also be viewed as a neural net in which the “neurons” are the community members together with the underlying web-based systems.

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As having been widely discussed in Knowledge Engineering, knowledge may essentially be represented as a networked structure, for instance, a kind of semantic network of concepts and predicative relations, a linked structure of a set of reasoning rules, or elements interconnected by a cognitive schema or a mental model. Thus the overall knowledge content of a community can inherently be viewed as a network of knowledge elements. This knowledge network is a conceptual network with its constituents being actually embedded in the human brains and the Web. The whole *knowledge network* is structured by the conceptual and logical connections of these knowledge constituents.

2. SOME RESEARCH ISSUES

The generation and evolution of intelligence in web community depend immensely on the development of the virtual *knowledge network* of the community. Thus one fundamental research concern is to unveil the hidden analyses of the knowledge transfer model between human beings.

Besides conceptual, logical and empirical analyses, which may be embedded on socio-psychological studies, are important to pursue better understandings of actual knowledge-transfer mechanics through communications and collaborations. To explore the dynamics of the formation and evolution of intelligence in web community, the emphasis should be kept on the knowledge processes such as knowledge transmission, integration and creation, which are more or less intangible. Modeling of such knowledge processes in the social and technological environments is a great challenge. As we mentioned earlier, ICT are critical for the realization of community intelligence. A successive question would then be how the intelligence of web community can be supported by the information and communication technologies. In today's WWW, how can the Web technologies be used to facilitate efficient knowledge transmission, integration and creation in web community? The "knowledge organization" (Akerkar and Sajja 2010) and "knowledge visualization" (Eppler & Burkard 2004) technologies may be of great help in this respect. From this aspect, several technologies related to the Web 2.0 and Web 3.0 may set the technological bases for advance research and innovation.

Although several aspects are still under investigation and others need to be taken into consideration, Web Intelligence is situated to play a vital role in the next generation Web Communities. In other words, without a doubt, the web communities field will remain to create a strong impact in the future and major challenge of this research in the next decade will be Web Intelligence centric, focusing on how intelligently make the best use of the widely available web connectivity.

3. PAPERS IN THE WORKSHOP

The papers, selected for this workshop, deal with some of the significant issues in the field. The keynote will be presented on *Web Intelligence through the Crowdsourcing of Semantics*. In this talk presents strategies for engaging human-intelligence to make the Web more semantic. In WI&C'14 workshop, five papers are selected for presentation. These papers are:

Population Dynamics in Open Source Communities: An Ecological Approach Applied to Github. The paper proposes to apply a well-known model in ecology, Lotka-Volterra model of host-parasite interactions to the ecology of open-source communities. Lotka-Volterra equations model the mutualistic relationship between parasites and hosts, describing the growth rate of animals and plants and the intraspecific competition.

History-Guided Conversational Recommendation. The paper presents a critiquing-based approach, History-Guided Recommendation (HGR) to be used for recommendation that helps to achieve a better interaction between both parties in an efficient way. HGR, which is capable of using the recommendation pairs or critiques only so far in the current recommendation session to predict the most likely product recommendations and thus short-cut the sometimes protracted recommendation sessions in standard critiquing approaches.

A Semantic Web of Know-How: Linked Data for Community-Centric Tasks. This work addresses the research issues of building a conceptual framework to deal with the procedure-oriented knowledge, or know-how, for community on the Semantic Web. Further, the paper argues about gaps to model the know-how type content, which is available in semi-structured forms on the forums or Web 2.0 sites these days.

Strengthening collaborative data analysis and decision making in web communities. This paper presents an approach for helping the collaboration in web communities by mixing in a web platform human and machine recommendations. It processes by a combination of data acquisition services, data mining services, collaboration support services and decision support services.

How limitations on the size of personal networks changes the structural properties of complex networks. The paper develops a multi-agent model to assess structural changes within a changing social network that is due to specifying a limit on the size of personal networks. The authors arrive at their conclusions by using a generative model of such networks and through an analysis of simulation results.

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