Analyzing Community Deliberation and Achieving Consensual Knowledge in SAM

Krissada Maleewong, Shinawatra University, Thailand

Chutiporn Anutariya, Shinawatra University, Thailand

Vilas Wuwongse, Asian Institute of Technology, Thailand

ABSTRACT

This paper presents a novel approach to harnessing collective intelligence that will allow a community to create, collaborate, and share knowledge based on the Semantic Argumentation Model (SAM). It encourages multiple users to express ideas or positions on complex issues, and to submit arguments that support or oppose the ideas of the other members. In principle, ideas considered possible solutions to an issue are those that contain high content quality and achieve great community agreement. Therefore, the authors define several useful measures to analyze the deliberation for determining the content quality, community preference, and achieving quality-assured consensual knowledge. Finally, a web-based prototype system founded on the proposed approach is developed and made available for public use. A preliminary study on the system usability shows that the system is practical and can enhance the collaborative knowledge creation and sharing process.

Keywords: Collaborative Knowledge Creation and Sharing, Collective Intelligence, Consensus Building, Content Quality, Semantic Argumentation

1. INTRODUCTION

Collective intelligence has become increasingly important for community-driven knowledge creation and sharing by enabling collaborative deliberation to society. Many collaborative knowledge management systems, especially social webs such as Wikis, blogs, discussion forums, and question-answering portals are continuing to grow with increasing number of contributors and covering a wide range of disciplines. Many are successful in encouraging people to participate actively in content creation and knowledge sharing which lead to the growth of innovative ideas and a substantial number of online community knowledge bases.

In order to take advantage of collective knowledge concerning complex problems or controversial challenges, multiple users collaboratively create and share knowledge based on their skills, viewpoints, and experiences. However, the quality and reliability of such user-generated content vary greatly depending on individuals' interests and expertise. This

often results in inconsistent and untrustworthy information. Moreover, a community unintentionally faces several conflicts due to the different opinions in geographically dispersed community and the lack of an effective mechanism for facilitating group collaboration and deliberation. Accordingly, the cost of content quality management and conflict resolution are unavoidable, and these problems are occasionally difficult to solve without human involvement.

To tackle such problems, this paper employs the *Semantic Argumentation Model* (*SAM*) (Maleewong, Anutariya, & Wuwongse, 2009a) to enhance collaborative knowledge creation and sharing by allowing members to raise issues on any topic and propose positions as alternative solutions. A member can submit arguments to support or oppose a particular position based on his judgment. The community deliberation are structurally and semantically captured and encoded in RDF/OWL language conforming to the *SAM Schema* (*SAMS*) (Maleewong, Anutariya, & Wuwongse, 2009a) which enables automated analysis across the community knowledge base. In order to achieve quality-assured consensual knowledge, a number of useful measures are formally defined for measuring the quality of users' generated contents and determining group preference on a certain position. A high-quality position supported by most members is considered as a potential position to solve the issue. Moreover, the proposed feedback mechanism allows members to improve the position quality and revise their submitted arguments (and rebuttals) regarding other members' opinions for driving the community to achieve a consensus. In addition, an online collaborative knowledge creation and sharing system, namely *ciSAM*, has been developed in order to validate the practicality and usability of the proposed approach in real-world scenarios.

The organization of this paper is as follows: Section 2 describes the related work. Section 3 presents Semantic Argumentation Model. Section 4 explains community deliberation analysis. Section 5 draws discussions, conclusions, and future research direction.

2. RELATED WORK

By allowing users to easily create and edit articles, Wikipedia has grown to be the world's largest free encyclopedia. Its mechanism, however has resulted in edit war and vandalism problems (Viegas, Wattenberg, Kriss, & van Ham, 2007), which then lead to untrustworthy problems. Moreover, its history pages representing information in reverse chronological order (most recent first) also confuse its users when searching for an evolution of a specific knowledge. In order to improve information access and enable knowledge exchange across applications, *Semantic Wikipedia* (Krotzsch, Vrandecic, Volkel, & Haller, 2007) allows users to semantically annotate wiki pages. However, high technical skill is required for inexperienced users to structurally formalize their knowledge, and the several aforementioned problems caused by wiki mechanism remain unsolved.

To effectively capture the deliberation and to facilitate group collaboration, many recent researches have applied argumentation technologies in various domains as follows. *Compendium* (Shum, Selvin, Sierhuis, & Conklin, 2006) is a knowledge management environment, developed based on *graphical IBIS system* (*gIBIS*) (Conklin & Begeman, 1988), for supporting group deliberations. *Collaboratorium* (Iandoli, Klein, & Zollo, 2008) is a collaborative framework, which integrates *IBIS model* (Rittel & Kunz, 1970), *Walton's argumentation schemes* (Walton, 2006), and *Toulmin's Argument Scheme* (Toulmin, 1958) to capture discussions as argumentation networks. However, these systems do not have rich formal semantics to handle sophisticated processing of argumentative statements such as ensuring quality of argumentation and determining group agreement. With a focus on the ontology engineering domain, *DILIGENT* (Tempich, Simperl, Luczak, Studer, & Pinto, 2007) and *HCOME* (Kotis & Vouros, 2005) develop ontology engineering environments by applying the IBIS model to capture the discussion and allow members to construct an ontology in a collaborative manner. However, both systems

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