

Online Discussion Facilitation Support

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Abstract

In online discussion platforms, participants gather to discuss the effective approaches to solve the common issues they face. In order to facilitate these discussions to proceed smoothly and to build consensus efficiently, human facilitators are introduced into the discussions. However, human facilitator related problems such as human bias and scalability become critical with the increasing sophistication of online discussions. As a result, it is critical to find approaches to support facilitation in these discussions. Facilitation support is difficult in online discussion because it is a complex problem that involves many different factors that need to be considered. In this paper, we consider the discussion situation as a complex problem that cannot be solved by following a certain of rules. The answer to this problem is considered as a human-in-the-loop approach of generating facilitation support that could be conducted according to different situations. We propose a case based reasoning (CBR) approach to solve this problem in order to support online discussion facilitation. Two sorts of discussion case definition methods are designed to represent online discussion. This is considered as the first step for realizing automated facilitation support in the future.

Introduction

Online discussion is considered as one possible approach to solve common problem shared by a crowd of people. It is different from conventional social network, where users mainly share information and communicate with each other. In online discussion, participants are gathering together to perform one sort of process to achieve collective intelligence, which is defined as groups of individuals acting collectively in ways that seem intelligent (Malone, Laubacher, and Dellarocas 2009). The core advantage of holding online discussions is that people can join the discussion via the Internet without pressure of location issues or time issues. Famous platforms such as Climate CoLab (Introne et al. 2011), Deliberatorium (Mark 2007) and COLLAGREE (Ito et al. 2014) have been utilized to organize people to participant in online discussions about topics such as global climate change, law reform and city planning. In order to facilitate the discussion to proceed smoothly and achieve con-

sensus efficiently, human facilitators are introduced into online discussions to conduct facilitation task. However, with the increasing number of the participants in a certain discussion, human bias issues, scale issues and schedule issues become critical problems for human facilitators. As a result, it is critical to find approaches to support facilitation in these discussions.

In this research, our motivation lies in exploring potential solutions for discussion facilitation support to solve above mentioned issues. We propose a case-based reasoning (CBR) based approach to support facilitation in online discussions. Progress and existing challenges in this research direction are also introduced.

Related Work

In order to support facilitation in online discussion, the first step is to understand facilitation. Facilitation is defined as tasks about helping a group to have an efficient and inclusive meeting (Max Hertzberg 2013). In online discussion, it contains a number of tasks such as encouraging participants to post, keeping the meeting focus and clarifying and summarising points. Facilitation can be changed according to different situations and goals of the discussions. Checking the contents and structure of the posts according to guidelines also can be facilitation tasks in online discussion (Mark 2007). For different facilitation goals, different factors should be considered. However, little work has been done in designing common definitions for each sort of facilitation in online discussion.

Facilitation has been researched in the field of Group Decision Support System (GDSS), which is defined as Computer-based system that supports groups of people engaged in a common task or goal and that provides an interface to a shared environment (McLeod and Schell 2007). In the tasks such as agenda preparation, timekeeper, simple idea generation and voting, automated facilitation are shown to be possible to act as well as human facilitation or even better (Aiken and Vanjani 1998) (Wong and Aiken 2003). However, most of these tasks are predefined reasoning tasks or tasks of conducting particular facilitation. To the best of the author's knowledge, very little work has been done in supporting the reasoning of discussion facilitation in the dy-

namically changing discussion situations.

A Case-based Reasoning Approach for Online Discussion Facilitation Support

In order to support discussion facilitation according to dynamic discussion situations, we proposed a CBR based approach. CBR is one of the established artificial intelligence techniques that have been successfully used in real-world applications (Irissappane and Zhang 2015). It provides an effective reasoning paradigm for solving new problems by adopting similar solutions that have been proposed for similar problems in the past (Aamodt and Plaza 1994). This reasoning paradigm is very similar to the human facilitators' thinking paradigm. Intuitively it can be one possible reasoning approach to answer the question of the facilitation according to the complex discussion situations. A general CBR-based system is described by a four-step reasoning cycle that includes retrieve, reuse, revise and retain. When considering using CBR as the solution to solve a problem, it is not necessary to understand the specific rules inside the problem itself. It is rather important to find the essential characteristics which are used to express this problem. In the discussion case definition, the case description part that describes the problem and the case solution part that describes the solution related to the problem should be decided. Since we consider the discussion situation as a complex problem and the answer to this problem is the sort of facilitation that should be conducted, discussion situation is defined as the case description and facilitation is defined as the case solution.

In previous work, we focused on the facilitation task of encouraging participation during the discussion. In order to clarify the argumentation of complex online discussions and make the procedure of solving problems become more transparent, online discussions are represented by using issue based information system (IBIS) style, where complex problems are modelled as an argumentative process amongst several stockholders (Conklin 2005). Specifically, three sorts of elements are defined in the IBIS style argumentation which are issues, ideas and arguments. Issues are defined as the posts which are questions that need to be answered during the discussions. Ideas are defined as the possible answers to the issues. Arguments contains two sorts of elements which are pros and cons. Pros are defined as the support to an issue or an idea and cons are defined as the object to an issue or an idea. On the basis of these elements, two sorts of methods are proposed to define the description part of online discussion case. The first method is feature-vector representation, where case description parts are constructed from attribute-value perspective. Attribute-value pairs such as issue number, idea number and argument number are organized in a data table form (Gu et al. 2018). In this situation, case solution is represented as a particular value that points to different facilitation information. The second method is structure representation, where case description parts are constructed from structured graphs perspective (Gu et al. 2019). IBIS style node type along with the relation between nodes are utilized. Case solution is represented as the nodes that con-

tains generated facilitation information. For both methods, similarity calculation algorithms are applied and the ability of retrieving similar case from the case base are shown. The case solution part in the retrieved case is utilized as the facilitation suggestion in the related discussion situation.

Challenges and Future Work

In previous work, we modelled the online discussion into IBIS style and mainly focus on the type of the posts along with the relationship between them. These factors are utilized to decide whether participation encouragement should be added to the discussion. However, in order to apply the system in handling more sorts of discussion situations, there is still a lot of work need to be done. We list existing research challenges and important research directions for future work.

Discussion Definition

Other than the type of the posts and the relationship between them, more information such as post contents, user preference and user participation can be collected from an online discussion. By utilizing different combinations of discussion information, more sorts of discussion definition methods can be generated. It is a big challenge to find the useful information for reasoning different facilitation tasks. Also, it is critical to decide whether different facilitation tasks should be considered individually or collectively with each other.

Dataset Building

Real-world discussion data has been collected from different scenarios (Tan et al. 2016) (Zhang et al. 2016). However, these discussion data cannot be considered as the most suitable for above mentioned research problem because of the lack of facilitation information. Facilitation information should reflect the information generated to improve the online discussions. Facilitation information can be grouped by different facilitation tasks that relate to different facilitation goals. In addition, it is also necessary to reflect the efficiency of these generated facilitation information to the discussions in the data.

Facilitation Validation

Another challenge is the validation of the generated facilitation. Only valid facilitation information should be considered as successful experience that contribute to the future discussion. However, human bias could be generated if facilitation opinions come from only one or two human facilitators because there is no general rule of validating facilitation in online discussion. Even for the same facilitation task, different human facilitators may have different opinions. As a result, it is critical to involve domain experts in the validation of generated discussion facilitation and regard the validation as one part of human-in-the-loop process in order to collect well agreed valid facilitation information. In addition, it is also necessary to develop new approach to measure the influence that facilitation brings to the discussion, which makes it possible to proceed standard computational analysis.

Conclusion

In this paper, we introduce the background and related work of facilitation support in online discussions. We regard the discussion situation as a complex problem that cannot be solved by following a certain of rules. The answer to this problem is the facilitation that should be conducted according to different discussion situations. We propose a case-based reasoning approach for supporting facilitation in online discussion. In the future, we are going to build an online discussion case base dataset on the basis of annotated real-world discussion data and design evaluation criteria to conduct the validation.

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References

- Aamodt, A., and Plaza, E. 1994. Case-based reasoning: Foundational issues, methodological variations, and system approaches. *AI Commun.* 7(1):39–59.
- Aiken, M., and Vanjani, M. 1998. An automated gdss facilitator. Proceedings of the 29th Annual Conference of the Southwest Decision Sciences Institute, Dallas, TX.
- Conklin, J. 2005. *Dialogue Mapping: Building Shared Understanding of Wicked Problems*. New York, NY, USA: John Wiley & Sons, Inc.
- Gu, W.; Moustafa, A.; Ito, T.; Zhang, M.; and Yang, C. 2018. A case-based reasoning approach for automated facilitation in online discussion systems. In *The Proceedings of The 2018 International Conference on Knowledge, Information and Creativity Support Systems (KICSS 2018), Thailand*.
- Gu, W.; Moustafa, A.; Ito, T.; Zhang, M.; and Yang, C. 2019. A case-based reasoning approach for facilitating online discussions. In *PRICAI 2019: Trends in Artificial Intelligence*, 582–592. Cham: Springer International Publishing.
- Introne, J.; Laubacher, R.; Olson, G.; and Malone, T. 2011. The climate colab: Large scale model-based collaborative planning. In *2011 International Conference on Collaboration Technologies and Systems (CTS)*, 40–47.
- Irissappane, A. A., and Zhang, J. 2015. A case-based reasoning framework to choose trust models for different e-marketplace environments. *J. Artif. Int. Res.* 52(1):477–505.
- Ito, T.; Imi, Y.; Ito, T. K.; and Hideshima, E. 2014. Colagree: A facilitator-mediated large-scale consensus support system. In *Collective Intelligence*. MIT Cambridge, USA.
- Malone, T. W.; Laubacher, R.; and Dellarocas, C. N. 2009. Harnessing crowds: Mapping the genome of collective intelligence. *Technology* 1.
- Mark, K. 2007. How to harvest collective wisdom for complex problems: An introduction to the mit deliberatorium.
- Max Hertzberg, Rebecca Smith, R. W. 2013. *A Consensus Handbook: Co-operative decision-making for activists, co-ops and communities*. Seeds for Change Lancaster Co-operative Ltd.
- McLeod, R., and Schell, G. P. 2007. *Management information systems*. Pearson/Prentice Hall USA.
- Tan, C.; Niculae, V.; Danescu-Niculescu-Mizil, C.; and Lee, L. 2016. Winning arguments: Interaction dynamics and persuasion strategies in good-faith online discussions. *CoRR* abs/1602.01103.
- Wong, Z., and Aiken, M. 2003. Automated facilitation of electronic meetings. *Information & Management* 41(2):125 – 134.
- Zhang, J.; Kumar, R.; Ravi, S.; and Danescu-Niculescu-Mizil, C. 2016. Conversational flow in Oxford-style debates. In *Proceedings of the 2016 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, 136–141. San Diego, California: Association for Computational Linguistics.