Lu Xiao
The University of Western Ontario, London, ON

A Structured Virtual Space to Support Articulating and Sharing Rationales in Virtual Group Activities

Abstract: Prior studies have shown that articulating and sharing group members' rationales is beneficial in group activities. Yet there is limited understanding about design for sharing and organizing the rationales in virtual group activities. Addressing this research gap, this ongoing study explores design guidelines of a shared rationale space in a virtual group workspace. The user interface design of a work-in-progress rationale sharing groupware is presented.
Résumé : Des études antérieures ont démontré que l'articulation et le partage du raisonnement des membres d'un groupe sont bénéfiques aux activités du groupe. Pourtant, on comprend mal comment concevoir le design d'un espace de partage et d'organisation du raisonnement lors d'activités de groupe virtuelles. Cette étude en cours cherche à combler cette lacune en explorant les normes de design d'un espace de partage du raisonnement d'un groupe de travail virtuel. Sera présenté le design d'une ébauche d'interface graphique d'un espace de partage du raisonnement.

1. Introduction

A rationale is an explanation of the reasons underlying decisions, conclusions, and interpretations. Prior studies have shown that rationale articulation is beneficial to learning activities. For example, studies in case-based reasoning suggest that articulating rationales contributes to the students' performance of cognitive tasks (e.g., Kolodner and Simpson, 1989; Riesbeck and Schank, 1989). Education software programs have been developed to help students articulate the rationales in a specific learning context (e.g., Kolodner and Nagel, 1999; Xiao et al., 2008).

Sharing the group members' rationales affects group activities. Studies in situation awareness have shown that others' rationales play an important role in one's decision making process (Endsley, 2000). Xiao's study (Xiao, 2008) showed that in virtual group activities one's awareness of the other group members' rationales, namely, rationale awareness, contributes to his/her awareness of their knowledge, i.e., knowledge awareness. The same study also showed that one's rationale awareness contributes to his/her awareness of the other group members' intellectual contribution. Knowledge awareness is a critical aspect in CSCL activities (Engelmann et al., 2009) and being aware of each other's contribution is crucial to group performance (Roberson, 2006).

Design rationale studies have explored various techniques to capture and represent design rationales in group design activities, such as gIBIS (Conklin and Yakemovic, 1991), PHI (McCall, 1991), and QOC (MacLean et al., 1991). In these studies, a design rationale is a group artifact that is highly structured. For example, a process-oriented design rationale includes the reasons behind a design decision made at the group level, the alternatives and tradeoff analysis performed, and the argumentation that led to the decision.

Similar to design rationale studies, this study is interested in how to present and organize shared rationales in virtual group space. Differently, a rationale in this study is an individual artifact: it is the reasoning of the individual's decision. In the example of

generating a group document, each member may be responsible for a section of the document and needs to make a decision on how to structure the section. Compared to design rationales, this type of rationales is loosely structured: the decision is part of the individual's tasks that may not require group consensus; the rationale provides the justification but may not include a tradeoff analysis or a list of alternatives.

The other difference between design rationale studies and this study is the goal of archiving and representing the rationales. While design rationale studies focus on knowledge reuse and communication, this study investigates design support of one's awareness of other group members' decision, actions, and reasoning.

In contrast to design rationale studies, the investigation of design to support sharing and organizing individual rationales in virtual group space has received little attention in HCI. Addressing this research gap, this ongoing study explores the design guidelines of a shared rationale space in virtual group activities. The design goals of the shared rationale space are: to support one's rationale awareness, knowledge awareness, and awareness of the other group members' intellectual contribution.

Xiao (Xiao, 2008, 2008a) investigated the use of a free structured shared rationale space in her study. The results showed that the group members preferred their rationales being editable only by themselves but they welcomed the comments from the other group members. In her study, real time sharing was implemented at the keystroke level such that as one was constructing his/her rationale statement by entering word by word this process was visible in the shared space. The investigation showed that members felt uncomfortable of sharing the thought process of generating their rationales.

Built on these findings, a software program is being developed in this study to offer a structured shared rationale space in virtual group workspace. The rest of the paper presents the design of this software program and the future work plan.

2. A Structured Shared Rationale Space

The virtual group workspace has several spaces: a user list space indicating who are present in the workspace, a document organization space presenting a list view of the shared group documents, a document space for currently opened document, and a structured rationale space. When a document is opened, its associated rationales are displayed in the rationale space. Figure 1 shows the screenshot of a virtual group workspace.

A member opens the rationale entry dialog box for generating a rationale. In the dialog box, the member specifies the rationale category. If the member selects certain text segments of the document when creating the rationale, the segments are automatically shown in the box and the association between that portion and the rationale is archived. With this feature the segments that have rationales can be highlighted so as to provide contextual information when one reviews the rationales in the rationale space. A rationale is not shared until the member presses the "submit" button in the dialog box. After the rationale is entered in the shared rationale space, it cannot be edited. Figure 1 shows the rationale entry dialog box which was positioned in the shared rationale space for the sake of saving the figure's space.

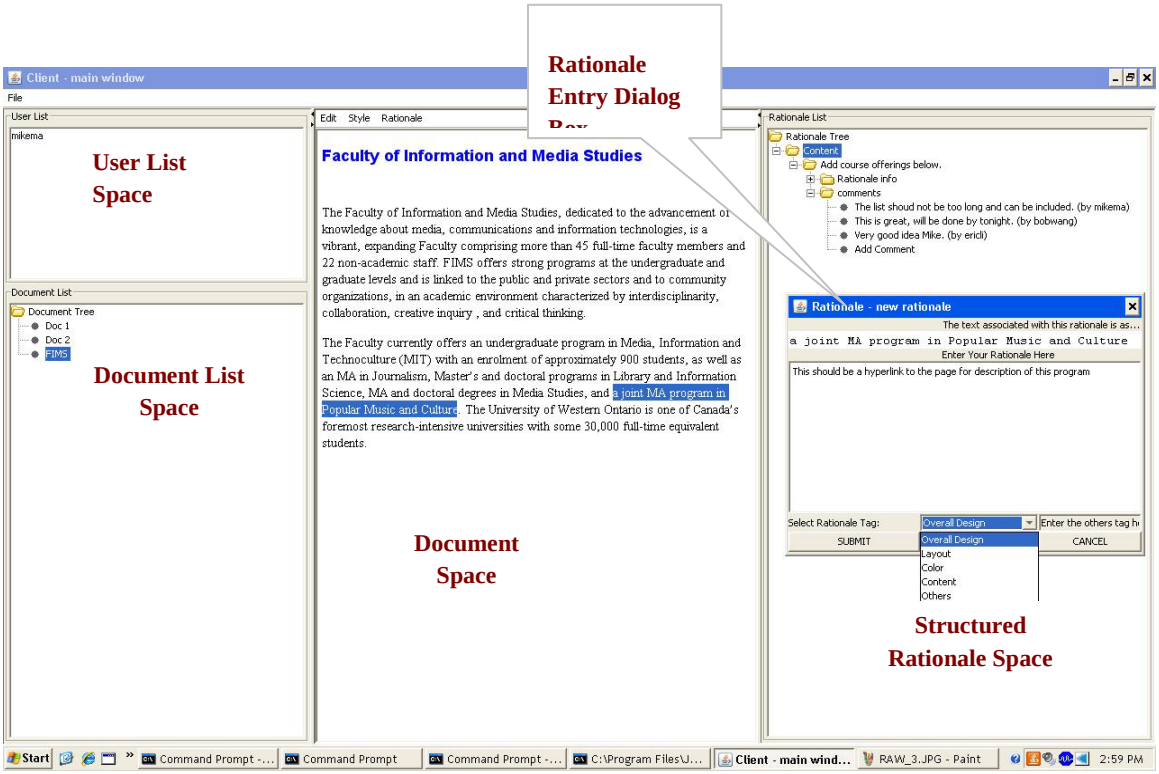

Figure 1. the screenshot of a group workspace when a member is generating a rationale for the highlighted segment in the group document.

The rationale space is tree structured. In the rationale space, the first level of the tree is for categories nodes that classify the rationales. A member specifies the category for his/her rationale when generating the rationale. The child nodes of the category nodes are rationale nodes with the rationale statement being their title. A rationale node has two rationale nodes named “Rationale info” and “comments” respectively. The “Rationale info” node contains information about the rationale’s author, creation time, and the average score. Any member except the rationale’s owner can score the rationale and the rationale’s average score is calculated by averaging all its scores by the group members. A member has to leave a comment explaining his/her score for the rationale and the comment will appear under the “Comments” node. A member can leave a comment without scoring the rationale as well. The “comments” node contains all the comments about the rationale with each comment being a child node of “Comments”.

3. Future Work

Current prototype adopts the category-based approach to partition the space. Another prototype is being designed that adopts the author-based approach. A comparative experiment will be carried out to examine the effectiveness of tree structured rationale space in supporting one’s rationale awareness, knowledge awareness, and awareness of the others’ intellectual contribution. The difference between the treatment and control groups is the design of the structured rationale space with the control group uses free structured space, and the treatment groups use category-based and author-based structured spaces. Participants will be administered an awareness survey that was used in Xiao’s study (Xiao, 2008) to understand perceived effects of rationale awareness on

knowledge awareness and awareness of intellectual contribution. Participants will also be interviewed to understand their collaboration experience and perceived effects of the shared rationale space. The interview guide that was used in Xiao's study (Xiao, 2008) will be leveraged and modified in this study.

This paper is directly related to the conference theme of "Exploring Interactions of People, Places and Information" by discussing an ongoing study of designing a virtual group *place* to help *people* share and organize a specific kind of contextual *information* of the group activity.

References

Conklin, J. E., Yakemovic, K. C. B., 1991, A process-oriented approach to design rationale. *Human-computer Interaction*, 6(3&4), 357-391

Endsley, M. R. Direct measurement of situation awareness: Validity and use of SAGAT. 2000, In M. R. Endsley & D. J. Garland (Eds.), *Situation Awareness Analysis and Measurement*, 147-173. Mahwah: Lawrence Erlbaum Associates.

Engelmann, T., Dehler, J., Bodemer, D., Buder, J., 2009, Knowledge awareness in CSCL: A psychological perspective, *Computers in Human Behavior*, 25, 949-960.

Kolodner, J. L. & Simpson, R. L. The MEDIATOR: Analysis of an Early Case-Based Reasoner, 1989, *Cognitive Science*, 13(4), 507 - 549.

Kolodner , J.L. & Nagel, K. The Design Discussion Area: A Collaborative Learning Tool in Support of Learning from Problem-Solving and Design Activities, 1999, *Proc. of Computer-Supported Collaborative Learning*. Palo Alto, CA, 300-307.

MacLean, A., Yong, R.M., Bellotti, V.M.E., & Moran, T.P. Questions, options, and criteria: elements of design space analysis, 1991, *Human-computer interaction*, 6(3&4), 201-250

McCall, R.J. PHI: A conceptual foundation for design hypermedia, 1991, *Design studies*, 12(1), 30-41.

Riesbeck, C.K., Schank, R.C. *Inside Case-Based Reasoning*, 1989, Mahwah, NJ: Erlbaum.

Roberson, Q., Justice in Teams: The Effects of Interdependence and Identification on Referent Choice and Justice Climate Strength, 2006, *Social Justice Research*, 19 (3), 22, 323-344

Turns, J. Learning essays and the reflective learner: supporting assessment in engineering design education, 1997, *Proc. of Frontiers in Education Conf.*, vol. 2, pp.681-688.

Xiao, L., Clark, S., Rosson, M. B., Carroll, J. M., 2008, Promoting Reflective Thinking in Collaborative Learning Activities, *Proc. of 8th IEEE Int. Conf. on Adv. Learning Tech.*, pp. 709-711.

Xiao, L., 2008, *The Effects of Computer-Supported Rationale Awareness in Hybrid Collaborative Learning Activities*, Doctoral Thesis, The Pennsylvania State University.

Xiao, L., 2008a, A Virtual Group Workspace for Rationale Sharing in Distributed Collaborative Learning Activities, *Proc. of IEEE Int. Conf. on Computer Science and Software Engineering*, vol. 5, pp.125-128