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CSCL Discussion Support with Emphasizing Feature of Main Sentence

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Abstract: In this paper the authors propose a method and a system to support CSCL discussion with use of a developed function to emphasize the main sentence of each utterance. Generally, CSCL discussion environment has a difficulty to read huge volume of many utterances. The authors propose a function to provide two parts of input text fields, one is for main sentence of conclusion of an utterance, the other is for details or justifications of the utterance. At the time of representation, the proposing system first shows a list of main sentences. When members want to see details of an utterance, he or she clicks a link attached to the target main sentence. With use of the proposed function, a member of CSCL discussion will become easy to grasp a big picture of a discussion. It is expected to provide deep understanding of discussion and prompt to write meaningful utterances on CSCL. In order to verify an effect of the proposing system, the authors conducted a controlled experiment. The result shows that members of a target group tend to use various types of utterance roles rather than ones of a control group. From this result, the proposing system is thought to provides a CSCL environment for deeper understanding of discussion and utterances.

Keywords: CSCL, discussion, main sentence, utterance role, controlled experiment

1. Introduction

Collaborative learning and CSCL (Computer Supported Collaborative Learning) have established specific research areas in the learning science and e-learning. Researches on CSCL have been active from late 1990's. ISLS (2013) started International conferences of CSCL in 1995, and holding in every two years. Japanese Society for Information and Systems in Education (JSiSE) started a task force for CSCL and Supporting Technology in 2003. Kojiri et al. (2006) compiled the result of investigation and discussion of this task force. In this activity, many problems were pointed out for CSCL supporting environments. One major problem is readability of text-based CSCL discussion. There are many uploaded utterances on a server for one discussion, and members should read and understand whole sentences. Since this reading and understanding takes long time and concentration, some members may drop out to follow the discussion.

In order to prevent this problem, there are many proposals. The first category is to add “role” to each utterance and help understanding the abstract meaning. For example, Barros & Verdejo (2000) provided 6 roles of Proposition, Alternative proposition, Comment, Justification, Question, and Answer. Weinberger & Fischer (2006) limited the roles into 3: Opinion, Counter argument, and Reasoning. The second category is to visualize structure of discussion or relationships between utterances. For example, Mühlenbrock & Hoppe (1999) proposed a system to visualize a sequence of utterances for collaborative problem-solving activities. Bakers et al. (2002) proposed a system to represent utterances of debate discussion in two-dimensional space. The third category is to analyze context of utterances and summarize them with use of NLP (Natural Language Processing) function. For example, Kim et al. (2008) proposes a system called PedaBot, to refer related utterances automatically with use of TF-IDF method. Tsurugi et al. (2008) utilized morphological analysis to correlate utterances.

Unlike the approaches above, the authors propose a function to provide two parts of input text fields, one is for main sentence of conclusion of an utterance, the other is for details or justifications

of the utterance. This way forces some additional workload to CSCL members to input the text. However, there are major 2 advantages.

- When one inputs a body text, he or she is forced to summarize one's utterance. It gives a chance to rethink whether the utterance is consistent and summarized or not. Then it facilitates logical communication skills in CSCL environment.
- When other members refer the utterance, the proposing system first provides a list of main sentences only. When members want to see details of an utterance, he or she clicks a link attached to the target main sentence. It helps faster understanding of discussion and trend of utterances.

2. Proposing System

The proposing system is implemented on a Web server, and utilizes a copyright-free online discussion system. The authors modified it and provided the functions with use of PHP script and MySQL database. Figure 1 shows a screen of utterance input. It has 3 text input parts: member name, main sentence, and details. In order to analyze utterance tendency, he or she selects the utterance role: Proposal, Affirmative, Negative, Opinion, Question, and Reason. Finally there is a submit button. Figure 2 shows a screen of utterances representation screen. At the right hand side, there is a list of utterances. It just shows names, utterance roles, and main sentences. When a viewer clicks a main sentence, the whole body text appears at the left hand side of the screen. In order to control the representation in Figure 2, the authors also utilized JavaScript.

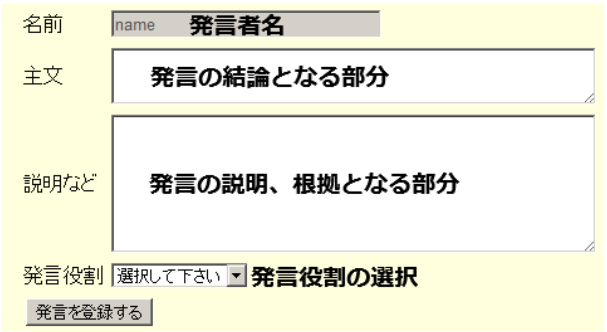

Figure 1. Utterance Input Screen

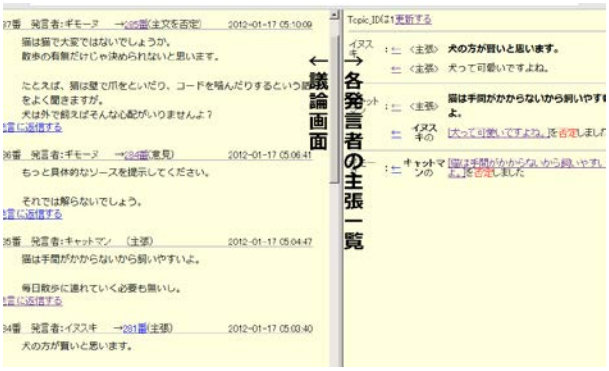

Figure 2. Utterances Representation Screen

3. Controlled Experiment

In order to verify the effect of the proposing system, the authors conducted a controlled experiment. The examinees were 34 undergraduate students of various faculties in Sophia University.

3.1 Sequence

First, a pre-test was conducted in order to organize Target group and Control group. They are introduced the usage of usual online discussion system with utterance role selection in 10 minutes and requested discussion in 30 minutes. The given discussion topic was "Is vide game harmful or not for youngers?".

Based on the pre-test, all examinees were divided into 2 Target groups and 2 Control groups, as all groups were non-significant in utterance frequency and utterance role distribution.

Next, a text was conducted. For the Target groups, the proposing system was assigned. On the other hand, the same system of the pre-test was assigned to the Control group. Discussions were done in 50 minutes for the topic "Electronic book will become popular or not?".

3.2 Result

In order to verify quantitative significance between TG and CG, the authors utilized 2 parameters.

1. Utterance Frequency (UF): how many utterances are appeared in the discussion. If the system forces to rethink and arrange one's utterance, there should be fewer utterances.
2. Role Distribution (RD): how far the utterance roles were distributed. If one uploads an utterance without deep thought, he or she tends to use one specific utterance role. If the roles are distributed, it shows that he or she views other utterances and selects one's utterance roles with deep thought.

For these parameters, the average scores and standard deviations are shown in Table 1.

Table 1: The Result

	Target Group (TG)	Control Group (CG)
Utterance Frequency (UF)	7.57 (SD=19.49)	4.71 (4.84)
Role Distribution (RD)	0.54 (0.081)	0.48 (0.023)

For UF, UF_{TG} is significantly lower than UF_{CG} ($p<5\%$). This result shows that the proposing system forces deep thought and arranged utterance. For RD, RD_{TG} is significantly higher than RD_{CG} ($p<5\%$). This result also shows that the proposing system forces deep thought and arranged utterance.

4. Conclusion

This paper proposed a simple method to divide "main sentence" and "details" when a CSCL learner inputs one's utterance. Although it was a simple idea, the controlled experiment showed clear significances of two parameters. There might be some arguments that parameters of UF and RD described in section 3.2 indicate deep thought of examinees or not. The authors will try to justify these relationships, and also find clearer quantitative evidences to show deep thought and meaningful discussion.

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