An Article Revising Support System for Facilitating Research Activities

Shinobu HASEGAWA [a, b] and Kazuya YAMANE [b]
[a] *Research Center for Distance Learning, JAIST, Japan*
[b] *School of Information Science, JAIST, Japan*
hasegawa@jaist.ac.jp

Abstract: Graduate and undergraduate students in the laboratory usually deal with not only formal information such as research articles and presentation documents but also informal information which represents a process of research activities. However, it is difficult for new students belonging to the laboratory to acquire such informal information from researchers and other students through the laboratory life. In order to resolve this issue, we have developed an article revising support system called CommentManager that facilitates the process of article revising and extracts the knowledge for revising from the informal information accumulated from the article revising processes of the laboratory members.

Keywords: Article Revising, Revising Knowledge, Informal Information, Research Activity

Introduction

In our daily research life, researchers and students, who belong to a research laboratory in university, have to handle various research activities with a large volume of information. They usually deal with not only formal information such as research articles but also informal information which represents a distinctive process of the activities. However, it is not so easy for the students, especially new students belonging to the laboratory, to acquire useful informal information such as research know-how for article revising and for planning a schedule of revising because the informal information has a problem of disappearing with time passage. It is also difficult for the laboratory members to transfer such knowledge to the novices of the laboratory. We have consequently developed an article revising support system called CommentManager that facilitates the process of article revising and extracts the knowledge for revising in the laboratory manner. One of the main features of CommentManager manages all the comments distributed by several versions of the research article as tickets which organize researcher's comments, students' answers and revised sentences. This makes it easier for them not only to comprehend the comments for their own articles but also to find high-frequent or deep-discussed comments from the tickets of the other members.

1. Article Revising Model

1.1 Process of Article Writing

In this paper, the target of the research activity is "article writing" that is frequently performed by the graduate or undergraduate students in their student life. Such activity

enables them to promote understanding of not only specific research findings but also widespread reasoning skill [1]. The process of article writing usually involves a series of revising documents with comments and corrections by the researcher. From this way of communication, they may be able to learn how to write the article practically. However, it is not so easy for them to accomplish the article according to the laboratory writing style. Some of the reasons why they have troubles in the process of article revising are as follows.

(a) The students, especially novice students in the laboratory, cannot reflect on the provided comment to the new version of the article because it is difficult to understand the researcher's intentions of the comments.

(b) They are often interrupted by revising not contents but style of the article because they are not always aware of what they should consider about the article writing style.

(c) Most of them cannot estimate the time to revise the article in advance because they do not have enough experience for article writing.

1.2 Approach

In the process of article revising, the researcher and the students exchange informal information which has a central function for article revising in a quick and efficient manner. From laboratory management point of view, it also makes the laboratory members communicate with each other effectively. However, it is difficult to figure out actual informal communication because it is implicit and disappears rapidly.

In order to resolve this issue, we need to provide the laboratory members with the knowledge for article revising in the laboratory manner. Our approach is to extract the knowledge by gathering the informal information existing in the process of article revising from the laboratory members. In this research, the informal information is managed by the ticket which means a set of researcher's comment and corresponding process for article revising by the students. For this reason, such information often exists in more than one version of the article as the history of the corrections of the comment. Therefore, we first design a ticket management function which stores the researcher's comments to be revised and the student's answers. This function would facilitate the revising process by managing status of each comment. At the same instant, the system gathers the tickets as the informal information and extracts check list and case examples as the revising knowledge. The check list is frequent-appeared comments from the researcher. The case examples are deep-discussed and complicated comments for the student. This makes the laboratory members trace other's correction process for the comments, if they had a trouble in the revising process.

2. CommentManager

We have developed an article revising support Web service called CommentManager. In the article revising process, many comments are exchanged between the researcher and the students. However, these comments are usually distributed by several versions of the article so far. CommentManager manages such comments as the tickets through the revising process. In addition, CommentManager provides the students with a knowledge transferring function that navigates high-frequent or complicated comments as the revising knowledge in the laboratory manner.

2.1 Ticket List

CommentManager has a version control function for not only the articles but also the comments as the tickets which means a set of comment, original and revised sentences, and the answers among versions of the article as shown in Figure 1. This makes the researcher and the students share the informal intention for the revising process. When the students upload a Microsoft Word document (.docx), CommentManager makes a ticket list from the comment metadata by using Office Open XML [2] automatically. After that, all communication for the comments and the answers takes place in CommentManager. In addition, the researcher and the students are able to set a status flag such as "try again" and "close it" to the tickets.
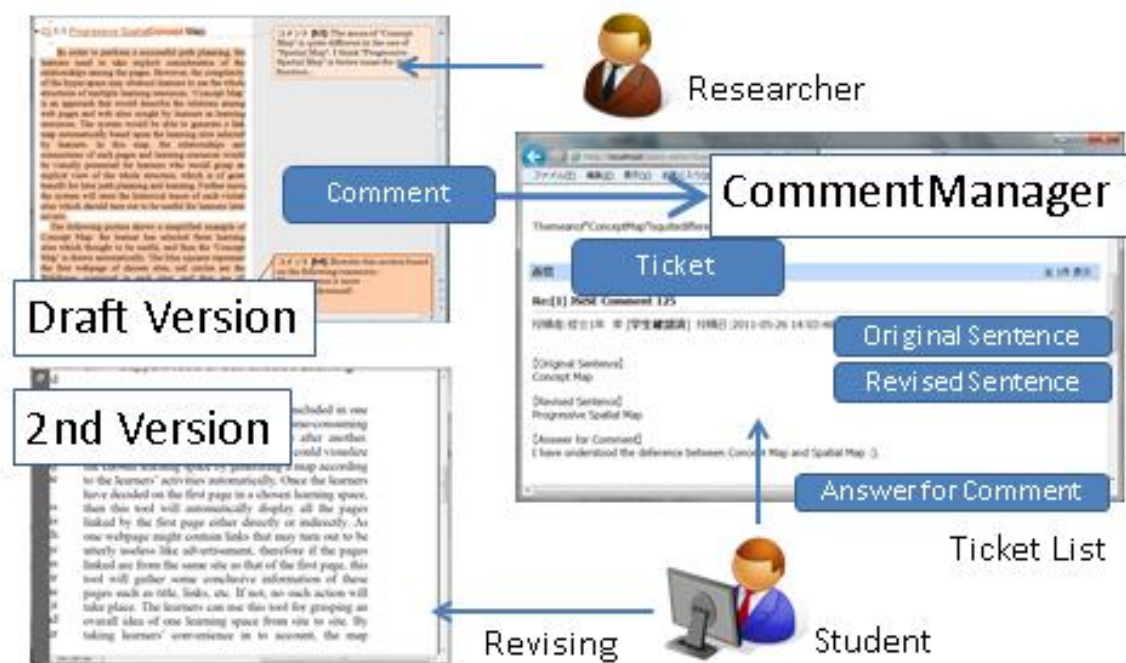

Figure 1. Sample of Extended Comment

2.2 Extracting Knowledge for Revising

The ticket implies the process of trial and error for revising. CommentManager extracts the revising knowledge by gathering such tickets from the laboratory members. CommentManager first lists the tickets that the researcher made frequently or typically as the check list. This would make the students notice important points for the researcher's check in advance. CommentManager also extracts the case examples that the students could not correct suitably by a single revising. Such process would be available for learning how to revise the complex comments in the laboratory manner.

2.3 Flow of Revising by CommentManager

Figure 2 shows a basic flow of revising by CommentManager. It has been implemented with PHP based on OpenTask [3] which is an open source bug tracking system. First, the student writes the draft version of the article using the check list so that he/she can avoid

basic indications from the researcher. And then the researcher makes comments for the draft version. Next, the student looks up the ticket, especially the ones revised more than once as the case examples, if he/she faces the comments that he/she is unsure how to deal with. Then the student writes down his/her ticket such as original/revised sentence and the answer for each comment to CommentManager. If needed, he/she is able to link the ticket to other comments that he/she use as a clue. Finally, the researcher checks the status of each ticket and changes the flag. If the flag is "try again", the researcher adds an advice so that the student can revise it effectively.

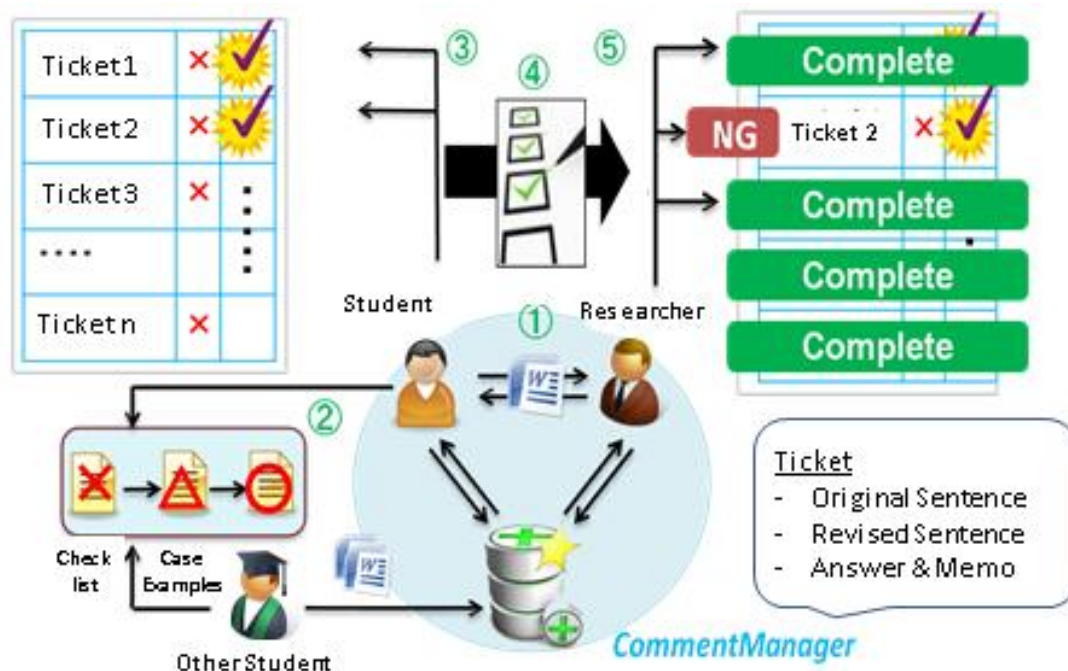Figure 2. Basic Flow of Revising by CommentManager.

3. Preliminary Case Studies

3.1 Observation of Comments

In order to analyses tendency of the comments, we observed logs for a student who used CommentManager in the process of writing/revising his master thesis. Figure 3 shows a number of the comments classified by the categories in each version of the article. From the results, the ones for *Comment for Sentence* and *Comment for Figure* tended to be closed in the early versions. On the other hand, the ones for *Direct Correction* were received in the last half version. Such tendency would depend on the strategy of article revising of the researcher. The reason why the comments were increasing from draft version to 2nd version because draft version was just 7 pages abstract and 2nd version was over 60 pages detail version. Compared with Microsoft Word, CommentManagere gave the researcher the intention of the student to the comment that he could not revise adequately. However, the student had a load for managing a lot of unimportant comments. One idea of this problem is to take ones for *Comment for Format* off so that he/she could reduce the load of the comment management.

3.2 Observation of Knowledge for Revising

In order to decide criteria for extracting the revising knowledg, we compared subjective case examples judged by the laboratory members to estimated case examples determined by whether the one was revised by a single revising. From 284 comments, the number of the subject case examples were 18 and the number of the estimated case examples were 17. 11 comments were contained within both of them (precision ratio = 61.1%, recall ratio = 64.7%). The results indicated CommentManager extracted a certain number of the case examples as the revising knowledge by managing the tickets. We would like to improve the accuracy by implementing an evaluation function by each student.
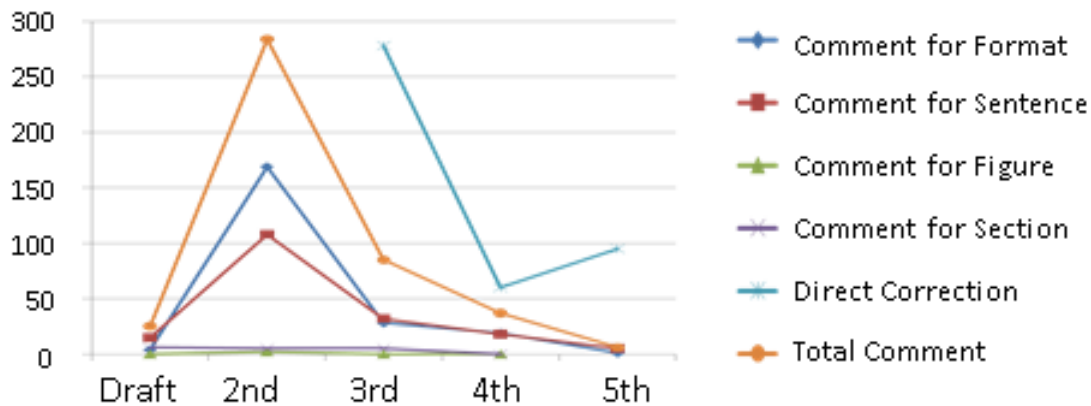

Figure 3. Variation with Number of Comments by Categories in Each Version

4. Conclusion

This paper has described the article revising support system called CommentManager. The fundamental functions of the system are to manage the tickets over the versions of the article and to provide the students with the revising knowledge by the form of the check list and the case examples. These functions would enable the laboratory members to transfer the revising knowledge to be shared, which would facilitate learning research skill.

In the near future, it will be necessary to improve the extraction accuracy and to facilitate skill development for writing the research article. We would also like to adopt this approach to the process of making the presentation document. Finally, we need to evaluate effectiveness of the functions by new students belonging to our laboratory in a more detail.

Acknowledgements

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