An Article/Presentation Revising Support System for Transferring Laboratory Knowledge

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Abstract: The main topic addressed in this paper is to develop an article/presentation revising support system for transferring experiential knowledge to be shared by a research laboratory in university. 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 them, especially new students belonging to the laboratory, to acquire such informal information from researchers and other students in the laboratory. In order to resolve this issue, we focus on the concept of laboratory knowledge. The laboratory knowledge is information such as research know-how, which facilitates the research activities for the laboratory members. We then demonstrate the article/presentation revising support system called CommentManager using the Office Open XML format. The system extracts the laboratory knowledge from the informal information accumulated from the laboratory members using.

Keywords: Article/Presentation Revising, Laboratory Knowledge, Informal Information Research Activity, Office Open XML

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 lot of information. They usually deal with not only formal information such as research articles and presentation documents but also informal information which represents a distinctive process of the activities in a laboratory manner. On the other hand, such laboratory periodically experiences a students' turn-over by their admission and graduation. Although management policy of the laboratory often remains the same for long period of time, it causes a decrease in number of students who have good experiments for performing the distinctive research activities. Therefore, it is difficult for the students, especially new students belonging to the laboratory, to acquire useful informal information accumulated from the laboratory members.

In order to resolve this issue, we adopt the concept of laboratory knowledge [1]. The laboratory knowledge is useful information such as research know-how for revising the articles or presentation and for making research schedule, which facilitates the research activities for the laboratories. For instance, actual process of trial and error for making a presentation document is one of the informal information. On the other hand, how to make a presentation in the laboratory manner is one of the laboratory knowledge extracted from the informal information or past experiences. Of course, it is important for the students to accumulate the informal information and to refine the laboratory knowledge so that they can

improve productivity of the research activities. However, informal information has the problem of disappearing with the time passage. It is also important for the laboratory members to transfer such knowledge to the novice students of the laboratory.

We have consequently developed an article/presentation revising support system called CommentManager that can extract the laboratory knowledge from the informal information accumulated in the process of revising the research articles by the laboratory members. One of the features of CommentManager manages all the comments distributed by several versions of the research article or presentation based on the Office Open XML[2]. This makes it easier for the students not only to comprehend the comments for their own articles or presentations but also to find high-frequent or useful comments by the other members.

In this paper, we first describe a model of the article/presentation revising and demonstrate the functions of CommentManager. We then report preliminary case studies by using CommentManager with the comment data described by the researcher in the articles that our laboratory students had written as master theses. The results of the case studies showed a potentiality for extracting the laboratory knowledge and some future tasks to improve CommentManager.

1. Article/Presentation Revising Model

1.1 Process of Article/Presentation Writing

In this paper, the target of the research activity is "article/presentation 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 [3]. The process of the article/presentation 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/presentation practically. However, it is not so easy for them to accomplish the article/presentation according to the laboratory writing style. One of the reasons why they do not learn sufficient writing skill is that the researcher does not always take a systematic approach for training of the article/presentation writing skill. Of course, the students often read some articles or see some presentations related to their research. But, it is difficult to learn the writing skill since the ways of writing are different in the ones written by the laboratory. They also learn how to write the research article/presentation by taking the courses or reading the books. But, these courses and books do not necessarily cover the specific writing style in their research field. For these reasons, the students do not have enough chance to learn the writing skill apart from corrections of the articles/presentations by the researcher. Therefore, the article/presentation revising is one of the important roles from laboratory education point of view.

1.2 Model of Article/Presentation Revising

Figure 1 shows a model of the typical failure process of the article/presentation writing. The student first writes a draft version of the article or presentation. The researcher then makes comments for the draft version. The student next seeks to correct the article/presentation, but he/she gets stuck on such revising. Some of the reasons why the student has troubles in the article/presentation revising are as follows.

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

(b) The student is often interrupted by revising not contents but style of the article/presentation because he/she is not always aware of what he/she should consider in the article/presentation writing.

(c) Most of the student cannot estimate the time to revise the article/presentation in advance because he/she does not have enough experience for the article/presentation writing.
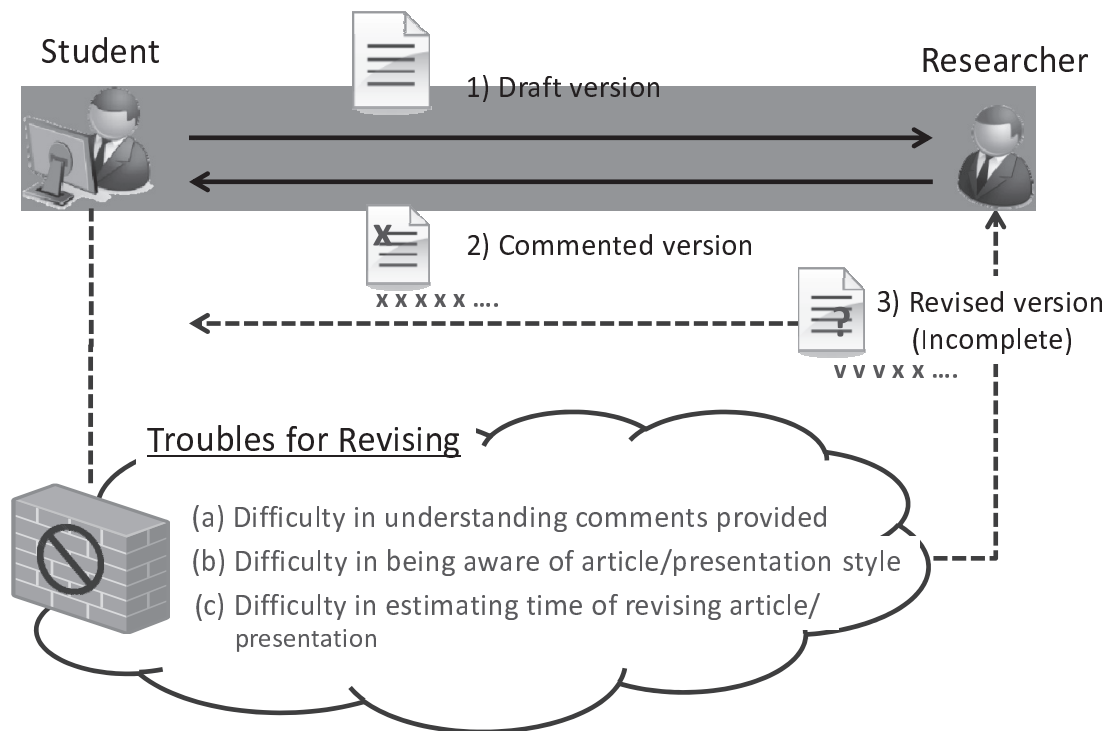
Figure 1. Model of Article/Presentation Revising

1.3 Approach

In the process of the revising, the researcher and the student exchange informal information. Such information has a central function for the article/presentation 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 laboratory knowledge for the article/presentation revising. Our approach is to extract the laboratory knowledge by gathering informal information existing in the process of the article/presentation revising from the laboratory members. In this research, the informal information means a set of researcher's comments and corresponding process for the article/presentation revising by the student. For this reason, such information often exists in more than one version of the article/presentation as the history of the corrections of the comment as shown in Figure 2. Therefore, we first design a comment management system which stores the researcher's comment to be revised and the student's answer. This system would facilitate the revising process by means of a comment list function which manages

status of the comments. At the same instant, the system gathers the comments and the answer as the informal information and extracts reference comments as the laboratory knowledge. The reference comments are frequent comments from the researcher or complex comments for the student. This makes the laboratory members trace other's corrections of the comment and the answer, if he/she had a trouble in the revising process.
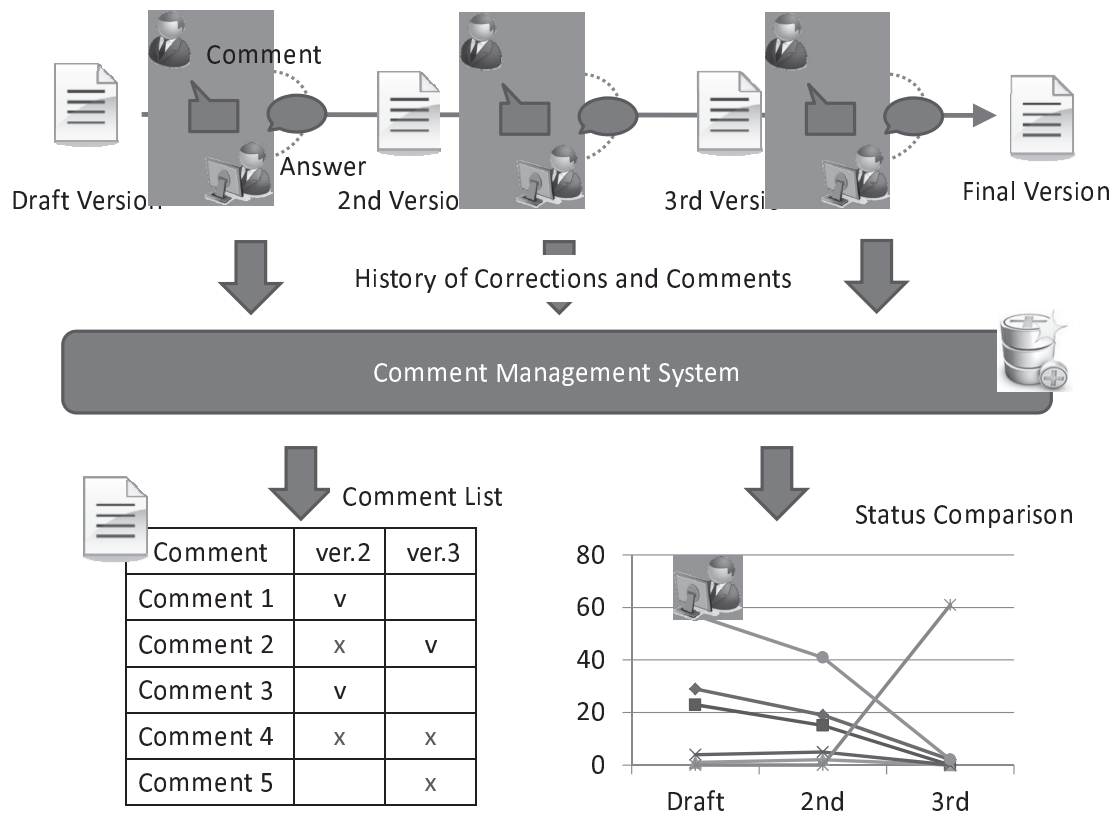

Figure 2. Concept of Comment Management System

2. CommentManager

We have developed an article/presentation revising support Web service called CommentManager. In the article/presentation revising process, many comments are exchanged between the researcher and the student. However, these comments are usually distributed by several versions of the article/presentation so far. CommentManager manages such comments as the informal information through the revising process. In addition, CommentManager provides the students with a knowledge transferring function which navigates related comments and high-frequent comments as the laboratory knowledge.

2.1 Extended Comment

CommentManager has a version control function for not only the articles/presentations but also the comments as extended comments. The extended comment means a set of comment, original and revised sentence, and the answer with the serial number among versions of the article/presentation as shown in Figure 3. This makes the researcher and the student share the informal intention for the revising. When the student uploads a Microsoft Word document (.docx) or a Microsost PowerPoint file (.pptx), CommentManager makes a

comment list from the comment metadata by using the Office Open XML automatically. After that, all communication for the comments and the answers takes place in CommentManager. In addition, the researcher and the student are able to set a status flag such as "try again" and "close it" to the extended comments.
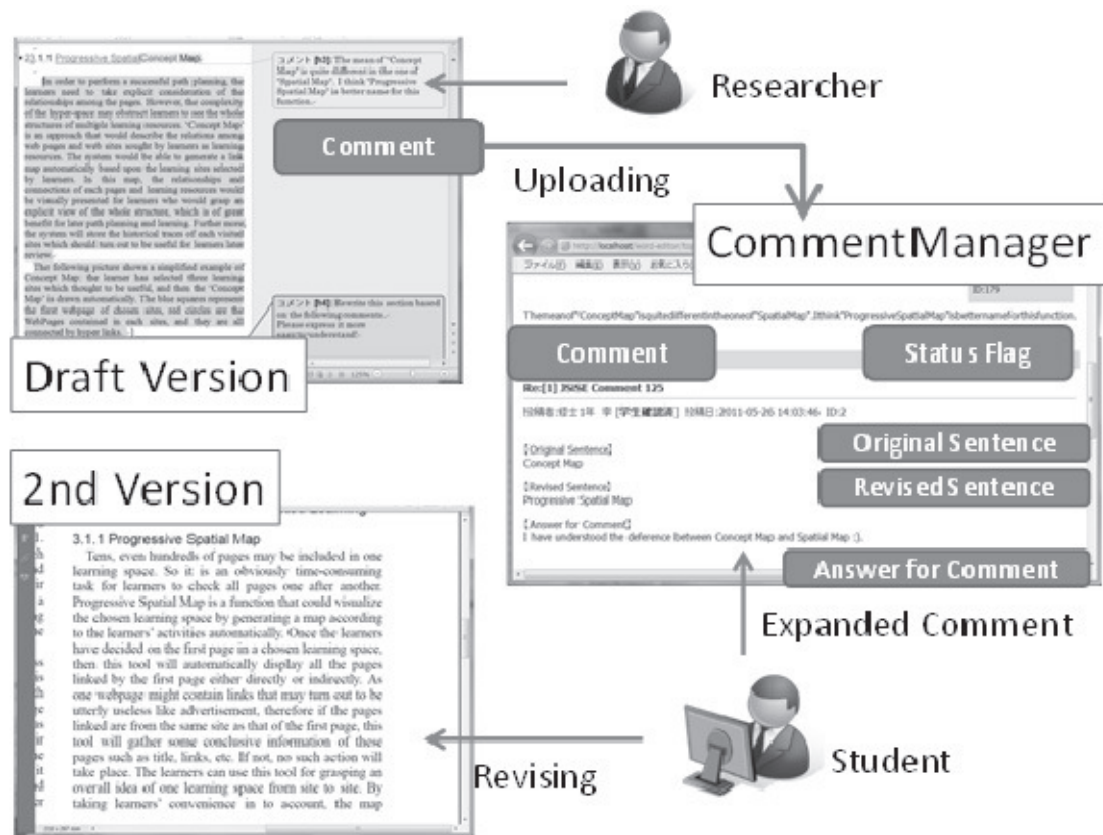

Figure 3. Sample of Extended Comment

2.2 Extracting Laboratory Knowledge

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

We have divided 200 over comments that the researcher of our laboratory makes in the article revising process of the laboratory old boys and girls into five categories as shown in Table 1. Weight in Table 1 means average time taken to respond to the comment in the category. These values were decided by actual time of the revising process. Therefore, Commentmanager calculates the estimate time needed to submit next version of the article/presentation if the student selects the category of the comments. It also compares writing schedule of the old boys and girls. These functions make the student plan the writing schedule of the article.

Table 1. Categories of Comment

Category	Weight	Description
Comment for Section	60 min.	Revising a section including course of story.
Comment for Sentence	20 min.	Revising a sentence including word definition.
Comment for Format	1 min.	Revising a format error.
Comment for Figure	30 min.	Revising a figure and associated sentence.
Direct Correction	1 min.	Revised by the researcher.

2.3 Flow of Revising by CommentManager

Figure 4 shows a basic flow of revising by CommentManager. It has been implemented with PHP based on OpenTask [4] 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 avoids basic indications. And then the researcher makes comments for the draft version. Next, the student looks up the expanded comment, especially the ones revised more than once as the reference comment, if he/she faces the comments that he/she is unsure how to deal with. The students write down his/her expanded comment such as original/revised sentence or slide and the answer for the comment to CommentManager. If needed, he/she is able to link the expanded comment to other comment that he/she use as a cue. Finally, the researcher checks the status of each expanded comment and changes the flag of the comment. If the flag is "try again", the researcher adds advice so that the student can revise it effectively.
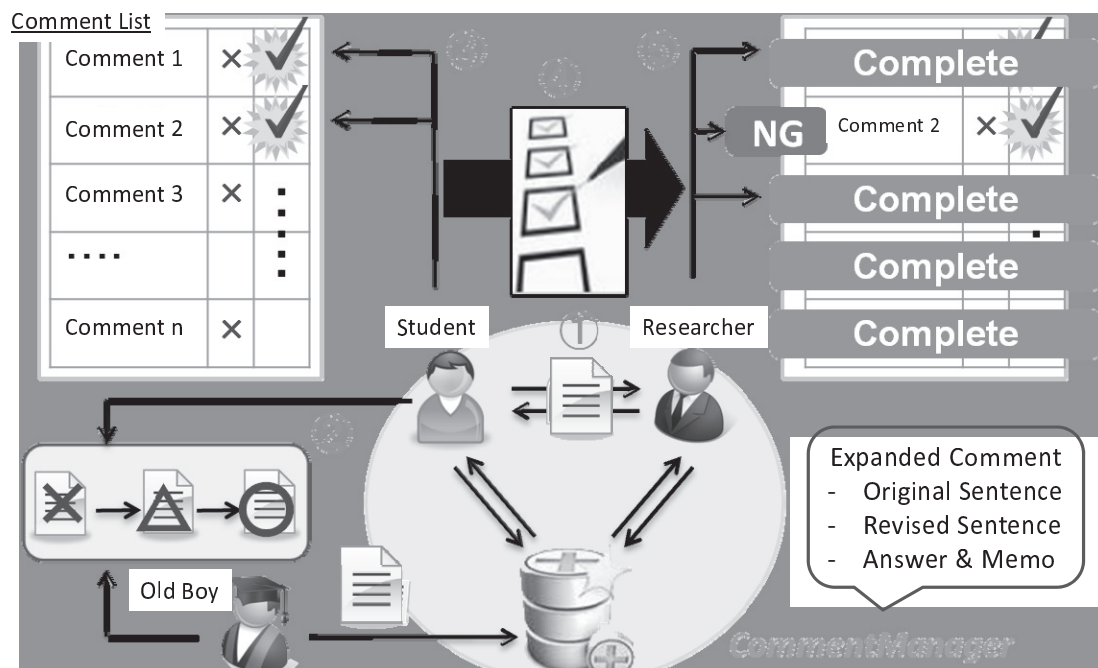

Figure 4. Basic Flow of Revising by CommentManager.

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 his master thesis. Figure 5 shows a number of

the comments classified by the categories in each version of the article. From the results, the comments for Comment for Sentence and Comment for Figure tended to be closed in the early versions. On the other hand, the comments for Direct Correction were received in the last half version. Such tendency would depend on the strategy of the 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 student's intention to the comment that he could not revise adequately. However, the student had a load for managing a lot of unimportant comments.
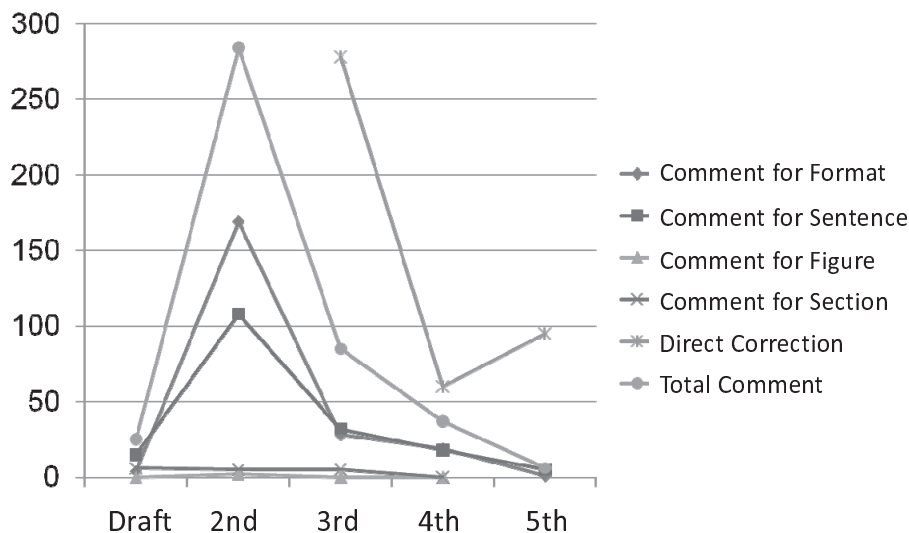

Figure 5. Variation with Number of Comment by Categories in Each Version

3.2 Observation of Laboratory Knowledge

In order to decide criteria for extracting the laboratory knowledge, we manually listed the comments made to 2 out of 3 students who wrote master thesis at January 2011 in our laboratory. Table 2 shows the candidates of the check list items. More than half of the candidates were matched with what the researcher usually coached. Therefore, we need to extract such candidates automatically.

We then compared subjective reference comments judged by the laboratory members to estimated reference comments determined by whether the one was revised by a single revising. From 284 comments, the number of the subject reference comments was 18 and the number of the estimated reference comments was 17. 11 comments were contained within both of them (precision ratio = 61.1%, recall ratio = 64.7%). The result indicated CommentManager extracted a certain number of the reference comments as the laboratory knowledge by managing the comment over the version of the article. We would like to improve the accuracy by implementing an evaluation function by each student.

4. Conclusion

This paper has described the article/presentation revising support system called CommentManager. The fundamental functions of the system are to manage the expanded comments over the versions of the article and to provide the students with the laboratory knowledge by the form of the check list and the reference comments. These functions would

enable the laboratory members to transfer the laboratory knowledge to be shared such as research know-how, which would facilitate learning research skill.

In addition, this paper has discussed the preliminary case studies for confirming effectiveness of CommentManager by using the comment data described in the articles that our laboratory members had written. We first inputted the informal information such as "memo of the trial and error" by using CommentManager, and then analyzed what the laboratory knowledge was extracted from the system. The results of the case study showed potentiality for extracting the laboratory knowledge, which would support the article revising process of the new students.

In the near future, it will be necessary to improve the extraction accuracy and to facilitate skill development for writing the research article. Finally, we need to evaluate effectiveness of the functions by new students belonging to our laboratory in a more detail.

Table 2. Candidates of Check List

Candidates by Multiple Comments	Number of Commented Students	Evaluation by Researcher
Specify the definition of new technical term.	3	Important
Standardize technical term in the article.	3	Important
Describe why the support needs.	3	Important
Use concrete examples.	3	Important
Match figure and sentences.	3	Normal
Rewrite complex sentence to short sentence.	3	Important
Study and list reference work.	3	Important
Correct typographical and grammatical errors.	3	Normal
Divide paragraph adequately.	2	Normal
Check font style and size.	2	Normal
Avoid being redundant in sentences	2	Normal

Acknowledgements

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