

Using Digital Document Network System for Group Learning Activities

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Abstract. With the increasing volume of privately-owned digital documents it is becoming more important to manage the documents for effective use. For document management, we propose a digital document network system. The system has been improved for use as a group-learning assistance system. In this paper the functions added to the system are explained. The validity of the system was evaluated by observing the behaviors of the students who used the learning assistance system for their learning and by interviewing them.

Keywords: Digital document · Group learning

1 Introduction

People acquire knowledge from the content of privately-owned paper documents and books and write notes or put sticky notes on them. For digital documents, the volume of which has been increasing dramatically in recent years, application software has been developed with a function for putting notes on the digital documents. With both paper documents and digital documents, it is important to understand the relation between documents in order to enrich one's knowledge of a target field. The digital network system [1–3] that we propose controls digital documents related to a certain field. The user puts marks on the documents and creates links between the marks. By doing so, the user can save the relation between the documents and establish a network of documents. By searching the documents in the network with a keyword or following the links, the user can easily recapture information that he/she previously accessed.

We recently improved the system to make it a group-learning assistance system. If multiple students develop a digital document network of a specific field, they can learn from each other and acquire rich knowledge that they could not obtain by themselves.

In this paper, the functions of the digital document network system are introduced in Sect. 2. In Sect. 3, functions added for group learning are explained. Students actually used the system for learning. The results of the observation of the students and the evaluation of the improved system are presented below.

2 Digital Document Network System

The proposed digital document network system creates a network of privately-collected digital documents by adding marks, notes, and links (Fig. 1).

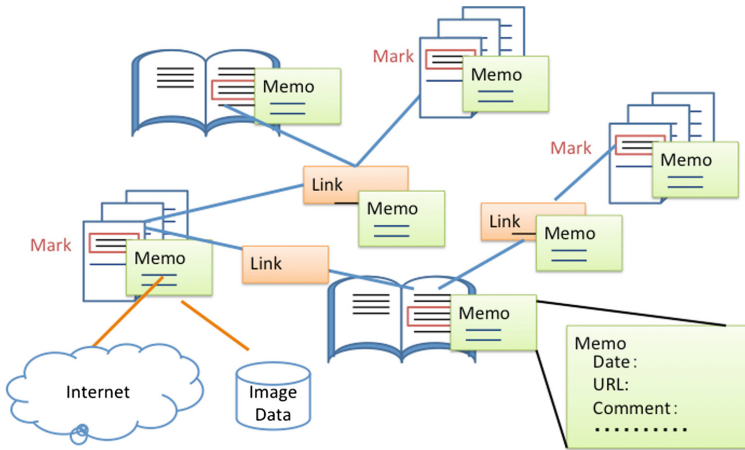


Fig. 1. Digital document network

A mark is a place that a user designates in a document. A link connects two marks. A note can be put on a mark or link. A network of documents can be formed by repeating these operations.

The notes in the document network can be searched with keywords. One can move on the links between the marks with the help of the notes and find related documents successively. By associating the accumulated documents with each other in this manner, we can use the collection of documents as a knowledge base.

This system was originally developed for researchers or specialists to organize and coordinate documents of specific areas of expertise. If this organizing and coordinating action is replaced with a learning action, the system can be used also by students. Students can register documents provided as learning materials and documents that they collect and put marks, notes, and links on the documents to deepen their knowledge.

3 Function Enhancement for Group Learning

The system was improved by adding the following four functions to make it a group-learning assistance system.

1. User registration and user designation
2. Mark display
3. Merging of multiple document networks
4. Log browsing

The four functions are explained below.

User Registration and user Designation. To find who is using the system, one can designate before starting the operation who is going to use the system. If the same user uses the system successively, the user who made the previous operation is automatically set to current user. Therefore designation of user is only necessary when the user is changed.

Mark Display. Each user can designate his/her own color of mark. When finding a mark on a document, the users can identify the owner of the mark from the color. With this function, one can easily find what interests each user.

Merging of Multiple Document Network. The system allows students to create individual document networks and merge them into a single network. The documents, marks, notes, and links constituting the document network are saved in a database. The merging function integrates multiple databases into one.

Log Browsing. Operations made on the system are all saved as logs in the database. The data of who made the operations are also saved. One can track the learning process by exploring the logs.

4 System Evaluation

Making a network of collected material is effective for learning a new field and deepening knowledge. If the network is made by multiple learners, the effect is enhanced. To find out whether the system is effective as assist system for multiple users to develop knowledge of a new field of study in their group work, two university students were employed as examinees to perform the experiment (Fig. 2). The process of the experiment was observed to evaluate the system.

The experiments were performed in the following steps:

1. The students collected materials related to a one-day lecture from the Internet and saved them in pdf document files. (About 60 min)
2. The students put notes on the original lecture materials and newly-collected materials and made links between the materials that were related to each other. (About 60 min)
3. The networks that two students made separately were merged into one.
4. Each student tried to find what documents the other student collected and what notes and links the other student had added. (About 30 min)
5. Teachers joined the group and made comments or instigated discussions. (About 30 min)

The title of the lecture used for the experiment was “Case example of mistaken arrest for posting a threat on a bulletin board.” Examinees A and B collected 21 and 8 materials respectively from the Internet, added 27 and 16 notes respectively, and created 15 and 8 links respectively.

Student examinees’ comments:

- Even when looking for the same thing, we reached different documents. This could deepen each other’s understanding.
- The system allows me to find out about another person’s learning process. In particular, when one finds the content of another’s notes or the location of another’s links, it motivates each other’s learning.
- Even when we choose the same material, the location or the content of the notes could be different between us. It was interesting that we can find the location or content of each other’s notes.

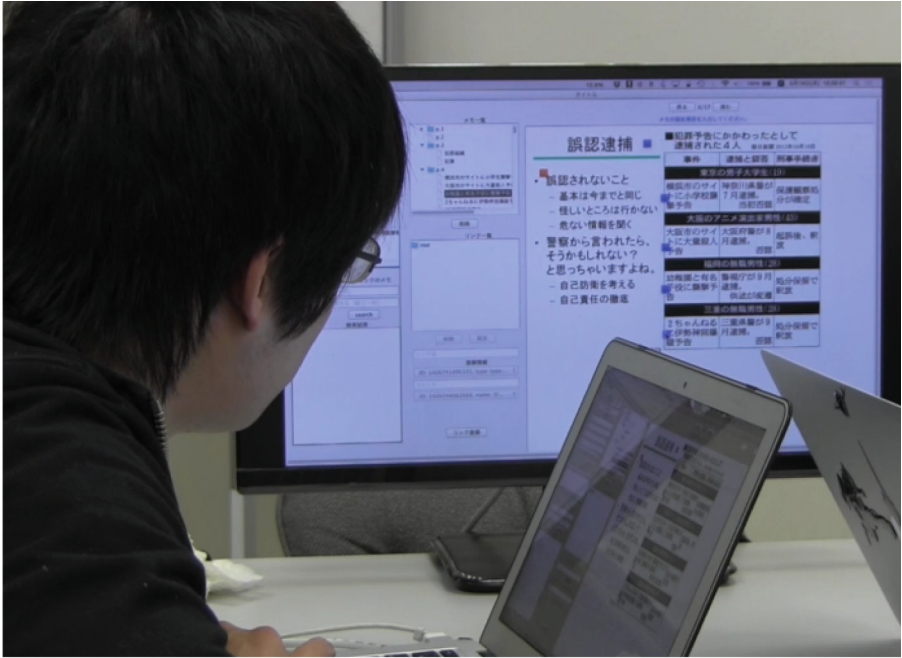


Fig. 2. Students discuss by using the system

- When I browse the Internet, I sometimes get lost. However in this case, there is a core document that is lecture material and we can browse the network based on it.
- The texts of that day's lecture are placed in parallel. This arrangement does not show a clear relation between them and could be improved.

- Some put a note on a specific point of a document and some put a note on a heading line. It is interesting to see the different ways in which people consult documents.
- In particular, finding how others add notes and links is useful for a deeper understanding of the lecture.

Comments of the teachers who joined the experiments:

- Not only seeing the final results of what the students found out but also knowing what reference materials they studied and how they studied is effective.
- I could find out what the students understood. Also, from the notes and links I could find out how widely and how deeply the students learned about the subject.
- This system would be useful for reference searching in our seminar.
- The difference in the set number of notes or links between students is interesting.

5 Conclusions

In this study we improved the system for making a digital document network for group learning and evaluated the improved system. This paper presents analysis of the results.

In future we will add more functions effective for group work. As it is necessary to have support for developing an effective network, we will give shape to the relation between various kinds of knowledge and set a standard for the network development.

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