Understanding Presentation Document with Visualization of Connections between Presentation Slides

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Abstract

Recently, there has been increasing opportunities to utilize presentation documents consisting of slides as learning contents via the Web services such as SlideShare. In learning a presentation document, the learners generally need to select a number of slides from the document, which describe what they want to learn or should learn. However, it is not so easy to find out the slides to be learnt since what each slide represents is not concisely stated and the connections between the adjacent slides are not explicitly expressed. They accordingly take more time for learning, and finish learning with incomplete knowledge. In order to address this issue, this paper introduces a model of how to understand the presentation document. We also propose a map for visualizing the logical connections between the slides, which follows the model. This map helps learners identify the sequence of slides to be learnt from the presentation document, and allow them to comprehend the structure embedded in the document in shorter time. In addition, this paper reports a case study for generating the visualization map.

Keywords: presentation, structured presentation, connections between presentation slides, understanding presentation document, visualization

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1. Introduction

Presentation documents are generally composed so that the contents could be transferred to the audience in a plain and precise way. Recently, there has been increasing opportunities to utilize presentation documents consisting of slides as learning contents. The learning objectives are classified into two types, which are to understand the whole presentation document, and to understand a part of the document including a number of slides the learners want to learn. The lectures conducted with such presentation documents in university classes are often learnt under the former learning objective. The students are often provided with the handouts of the slides in advance. Listening to the lecture, the students could refer to the handouts to understand about the lecture. On the other hand, the Web services such as SlideShare [1], which allow the users to easily publish and share the presentation documents created for academic conferences, technical seminars, survey reports, etc., are often investigated under the latter objective. In such Web services, a great number of and various fields of presentation documents are usable and sharable for learning. The number of the shared presentation documents is increasing rapidly. The services also allow the learners to immediately get access to the presentation documents embedding knowledge or concepts they want to investigate.

In investigating a number of slides in a presentation document, the learners generally need to find out the slides from the document, which describe what they want to learn or should learn. However, it is not so easy to find out the slides to be learnt particularly from the presentation document that deal with unorganized or ill-structured subjects such as state-of-the-art research. We think there are the following two reasons. First, the learners need to look into the contents of all slides since what each slide represents is not concisely stated. Second, they cannot identify the sequence of the slides to be learnt since the connections between the adjacent slides are not explicitly expressed. They accordingly take more time for learning, and finish learning with incomplete knowledge.

In order to address this issue, this paper introduces a model of how learners should investigate a number of slides in the presentation document to learn. We also propose a map for visualizing the logical connections between the adjacent slides, which follows the model. The proposed map helps learners identify the sequence of slides to be learnt from the presentation document describing unorganized and ill-structured subjects. Moreover, this paper reports a case study for generating the visualization map.

2. Related work

2.1. Creating presentation documents

We have been addressing the issue how to help novice researchers create their presentation documents using presentation schema [2, 3, 4]. The presentation schema represents typical presentation structure to be shared by laboratory members, which indicates what to present and in which order to present. It is used for composing the presentation structure to be embedded in the presentation documents. It also allows the novice researchers to create the well-organized presentation documents.

In creating a presentation document with the schema, the novice researchers are required to be aware of three tasks as shown in Fig.1, which are segmenting (dividing research contents into the contents of slides), connecting (making connections between the slides), and sequencing (sequencing the slides according to the connections). In our previous work [4], we focused on the process of creating a presentation document from segmenting to sequencing, but the work presented here focuses on the process of understanding the document, which corresponds to the opposite direction of the creation process. This paper also tackles the issue how to visualize the presentation structure from the sequence of slides consisting of the document.

Okamoto el al. have also proposed a presentation authoring tool, which visualizes the relationships between the slide contents and the corresponding oral explanation [5]. This tool enables the author to check excessive or deficient oral explanation for the contents of the slide. On the other hand, this paper does not use the relationships between the contents of slide and the oral explanation but the relationships between the slides.
2.2. Understanding presentation documents

Inoue et al. have proposed a model of knowledge construction with note taking in order to understand a presentation document for the lectures dealing with unorganized or ill-structured subjects in university. In this model, the learners are expected to listen to the lectures to extract keywords from the slides, which represents knowledge or concepts to be learnt [6]. They are then expected to connect the keywords to compose a knowledge map. In the work presented here, we plan to encourage the learners to compose such knowledge map for understanding the presentation document after visualizing the presentation structure, which is our future work.

Wang et al. have proposed the quick browsing method, which previews the content of slides with the word cloud, which are generated from the text data in the slides [7]. In this method, the learners can find out a single slide they want to learn with a visualized overview of each slide, which is generated using a text data analysis technique. This paper aims to help the learners find out the sequence of the slides to be learnt with the visualized structure of the presentation document.

3. How to promote the process of understanding presentation documents

3.1. Problem addressed

In this paper, we focus on the presentation documents dealing with unorganized or ill-structured subjects such as state-of-the-art research. The important knowledge/concepts embedded in the slides and the connections between them tend to be implicitly expressed in these documents. Unlike textbooks, these documents do not always provide a table of the contents, with which the learners can readily detect a number of slides to be learnt and decide the order of learning the slides. We also focus on researchers as target learners who at least have a prerequisite for understanding knowledge/concepts embedded in these documents. When such target learners refer to the presentation documents about the same research field, they often investigate not the whole contents of the presentation document but a part of the document such as the issued addressed, related work, research question, system/technology developed, evaluation procedure, etc. In this paper, we accordingly assume that the goal of learning a presentation document for research is to understand a part of the document.
The learners are also expected to understand a part of this kind of presentation document via the following three processes:

Step1: The learners first grasp the structure of the document in consideration of the connections between slides,
Step2: They next select the slides to be learnt using the structure, and extract the important knowledge/concepts from the contents of these slides, and
Step3: They then connect the extracted knowledge/concepts to build up their understanding.

The learners repeat these processes until they finish learning the document. However, it is not easy for the learners to detect the slides to be learnt particularly from the presentation document. We think there are the following two reasons. In Step1, the learners are first required to investigate the contents of all slides since what each slide represents is not concisely stated. In Step2, they are second required to detect the sequence of the slides to be learnt without the connections between the adjacent slides that are not explicitly expressed. In these processes, in other words, the learners are required to concurrently understand the structure of the document and the contents of each slide for the slide detection, which would be troublesome for them. As a result, the learners take a lot of time to learn the document, which often brings about their incomplete learning.

3.2. Proposed model

In order to resolve the above problem, this paper proposes a model of understanding a presentation document as shown in Fig.2, which provides the basis for promoting the understanding process. In the model, the learners are expected to detect a number of slides and their sequence that they want to learn from the document, and to extract the important knowledge/concepts from the contents of these slides. Such slide detection and knowledge extraction require the learners to understand the structure of the slides in the document.

This model consists of three phases, which are slide map generation phase, slide selection phase, and knowledge map building phase. Each phase is described below in detail.
3.2.1. Slide map generation phase
In this phase, a learner is expected to generate a map called slide map, which represents a logical structure embedded in the presentation document as logical connections between the slides. The slide map induces him/her to understand the structure of the document and to identify a number of slides that he/she wants to learn without investigating the contents of all slides. In generating the map, he/she is expected to look into the contents of the identified slides to define their logical connections. Augmenting and modifying the map, the learner can more deeply understand the logical connections between the slides.

3.2.2. Slide selection phase
In this phase, the learner is expected to select the slides to be learnt and the related ones from the slide map. The slide map allows him/her to identify the role of the slides and the sequence of the slides to be learnt, which promotes selecting the slides he/she should learn.

3.2.3. Knowledge map building phase
In this phase, the learner is expected to build a knowledge map with keywords to be extracted from the selected slides. In building the knowledge map, he/she is expected to connect the keywords to represent his/her knowledge learnt. He/she is also expected to get back to the slide selection phase to explore other slides if he/she becomes aware that the knowledge map built does not represent sufficient knowledge for their learning.

Although the model includes these three phases, the slide map generation phase is the most important one for promoting the process of understanding the presentation documents. Let us accordingly discuss the slide map in the following. In future, we plan to address the issues in the slide selection and knowledge map building according to the findings obtained from our previous work on [6].

3.3. Logical connections between slides
In order to represent the logical connections between the adjacent slides, this paper adopts the functions of conjunctions. The functions of conjunctions allow us to represent the logical connections independent of the slide contents. Ishiguro has classified the functions of conjunctions [8]. In this study, we follow this classification to define 10 types of logical connections as shown in Table 1. Moreover, the connection between the adjacent slides without the functions of conjunctions is defined as simple connection. These connection types allow the learners to comprehend the structure embedded in a presentation document in shorter time.
In this paper, the slide map visualizes the structure of presentation document with the logical connections. Fig. 3 shows an example of the slide map. This map consists of three areas, which are main-sequence area, support-sequence area and counter-sequence area. Also, each slide is represented as node and the connection between slides is represented as link between the corresponding nodes.

The main-sequence area includes the slides, which describes the main topic transferred to the audience by the presentation document. The learners are allowed to pursue the slide sequence in this area to learn the main topic of the presentation document. The support-sequence area also includes the slides, which provide supporting contents for the slides in the main-sequence area. On the other hand, the counter-sequence area includes the slides, which provide the contents counter to the slides in the main-sequence area. The slides in the support-sequence and counter-sequence areas are useful for them to promote their understanding of the slides in the main-sequence area.

On which sequence area each slide is put depends not on its contents but on the connection type of the link between slides. The link from a slide (called source slide) to the adjacent slide (called destination slide) is also visualized according to the connection type. Such visualization helps the learners readily grasp the slide structure embedded in the document. According to the connection types, in Fig. 4, the links between slides are classified into four, which are links used in the same sequence area (Link in the same sequence), links used in the main-sequence area (Link to main-sequence), links from the main-sequence area to support-sequence area (Link to support-sequence), and links from the main-sequence area to counter-sequence area (Link to counter-sequence). Following this classification, the slides are put on the corresponding areas. In order to prompt the learners to understand the structure of the document, representing each node by thumbnail image of the slide and with overlaying the slide title provides the overview of the structure for the learners.

Fig. 4 demonstrates how to visualize the link from the source slide to destination slide according to the connection type. Fig. 5 shows an example of the slide map about a research document using such visualization. This map allows the learners to know that most of slides are put on the main-sequence area, and that the contents of slide 9 (about system) and slide 14 (about evaluation) are illustrated in detail. They would also notice the main topic of the presentation document is the system and its evaluation. Such slide map helps learners identify the sequence of slides they want to learn. When researchers investigate the research contents such as the system, the approach and the evaluation described in a presentation document from the same research field, for example, the slide map allows them to identify the slides to be learnt in a shorter time.
3.5. Framework

In generating the slide map for a presentation document, as discussed in 3.1, the learners need to understand the contents of the slides with careful consideration of the logical connections. However, it is not easy for them to generate the map without background knowledge about the presentation document.

In order to help the learners generate the slide map, we examine the following steps:
To automatically generate the map from the contents of slides and oral explanation, and then to show the learners the map,

To show them the conjunctions included in each slide in addition to the map, and to help them understand the logical connections between slides, and

To allow them to modify the generated map to complete it.

As the reason for utilizing the oral explanation to generate the slide map, the contents of the slides are described concisely without the conjunctions, and the logical connection between the adjacent slides are often expressed by the oral explanation. In this study, we analyze the oral explanations described in notes panel of PowerPoint to detect the logical connections between the slides. Furthermore, the web services such as SlideShare provide not only the presentation documents but also the video recorded presentation appearance. The audio data in the video are converted to text data using speech recognition techniques, and the logical connections could be detected with the text data.

4. Case study

This section describes a case study we have conducted. In the proposed model, the slide map is built based on the logical connections between slides. If the slide map includes only simple connections, it could not help the learners understand the structure of the presentation document and detect a number of slides they want to learn since they are required to investigate the contents of all slides for their understanding and slide detection. In order to ascertain whether the slide map helpful to the learners could be generated, it is necessary to investigate to what extent each connection type appears in actual presentation documents, which was the main purpose of the study. The results would suggest the possibility of building the slide map from the documents.

In this case study, we accordingly analyzed the logical connections between slides in presentation documents created by our laboratory students, and the first author performed this analysis. The analyzed presentation documents were as follows:

- The authors were 7 fourth-year undergraduate students and 1 second-year master course student,
- The number of documents was 8, and
- The total number of the connections between slides was 186.
  (The average number of the connections was 23.3.)

4.1. Procedure

The analytical procedures was as follows:

- Step 1: The first author confirmed the contents of all slides in each presentation document and the contents of oral explanation in the note area of PowerPoint, and identified the relationships between the adjacent slides,
- Step 2: He attached the connection types classified in Table 1 to all of the relationships identified in the document, and
- Step 3: He analyzed the frequency and tendency of the attached connection types.

If there is no conjunction in the contents of the slides and the notes area in the step 1, the first author inferred the logical connection between the adjacent slides in consideration of the slide contents and oral explanation to attach the corresponding connection type.
4.2. Results

Table 2 shows the results of the case study. According to Table 2, 25.8% of all connections were simple connections, and were used as links in the same sequence. The rest of all connections (75.2%) were used as links in all of the sequences with function of conjunction. In particular, the frequencies in use of resultative, parallel, and illustration are comparatively higher than the other connections, and these connections tend to be used in the main-sequence area so that they could explain the main topic in the presentation. On the other hand, the frequencies in use of the connections in Link to support-sequence and Link to counter-sequence are low. However, contradictory conjunction appeared at least once in all of the presentation documents analyzed in this case study. The results show the possibility of building the slide map that could be used for the learners to detect the slides to be learnt.

5. Conclusion

This paper has introduced a model of how to understand the presentation document and proposed a map for visualizing the logical connections between the slides, which follows the model. The proposed map helps learners identify the sequence of the slides to be learnt from the presentation document describing unorganized and ill-structured subjects. This paper also has reported the possibility of generating the map using the logical connections between the contents of the adjacent slides in the actual presentation documents.

In future, we will develop a system based on the proposed model, and conduct an evaluation with the system in order to investigate the effectiveness of the map for understanding the structure of the document and to validate the model. Moreover, we will investigate the possibility of building the slide map from various fields of the documents.

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