様式 D-14

学 位 論 文 の 要 旨

論文題目

A Study on Structural and Semantic Analysis for Presentation Content Management
プレゼンテーションコンテンツ管理のための構造・意味分析に関する研究

印刷公表の方法及び時期　未公表

Motivation

With the advent of usable presentation tools to create attractive presentation contents, such as Microsoft PowerPoint, Apple Keynote, and OpenOffice Impress, presentations now play a socially important role in promoting understanding in many fields, including business and education. Many people have used Web services such as presentation sharing websites (e.g., SlideShare, Prezi) and MOOCs (e.g., Coursera, iTunes U) to store presentation contents that they use in speeches and lectures owing to the features for editing, browsing, sharing, and reusing presentation data. For example, most presentation contents with rich graphics and animations are prepared by using presentation tools such as Microsoft PowerPoint, Apple keynote, and recently online editor Prezi. In addition, presentation sharing websites such as SlideShare and Coursera provide an online presentation archive for later review with presentation slides or video recordings of speeches. Although useful and powerful support tools make it easy for creating presentation contents and Web services for sharing presentation contents are widely used, criticisms have pointed out their problems from the viewpoint of understandability of presentation contents. They are still a lack of support for users (1) acquiring relevant information implicit among presentation contents; (2) utilizing structural information explicit in presentation contents; and (3) grasping overviews of contextual information existing in presentation contents. This dissertation addresses these problems for improving understanding of presentation contents, enhancing user interactions through presentation contents by analyzing structural semantics and lexical semantics in presentation contents. In this doctoral dissertation, we are challenging to support for retrieval, generation, grasping overviews of presentation contents by focusing three critical issues, that is, **a) determining semantic relationships**, **b) extracting expression styles**, and **c) presenting presentation context**.

Our Approaches

In order to provide a presentation content management for next-generation presentation contents, we have to consider the emerging issues:

a) Determining semantic relationships

In order to support for retrieval of presentation content to readers or searchers, we need to explore how to determine semantic relationships implicit among presentation contents. To difficulty of

determine the semantic relationships, for instance, we develop a metadata extraction method to analyze two important features of metadata in the presentation contents: one is structural semantics that structured segments (i.e. itemized sentences of bullet points in slides), the other one is lexical semantics that semantic relations implicitly exist between keywords (i.e. an is-a, a part-of relations). In this way, it can help readers or searchers understand relevant information of slides well.

b) Extracting expression styles

In order to support for generation of presentation content to presenters and authors, we need to analyze various expression styles of existing presentation slides. To difficulty of extract the expression styles, in general, presentation slides are made from documents of a textbook for lectures. Then, we defined expression styles of slides that levels of words are located in slides based on the slide structures from documents. Therefore, expression styles which contain words from the documents are located in which level positions of which slides. In this way, it can help presenters or authors generate presentation slides in desired expression styles of existing slides.

c) Presenting presentation context

In order to support for grasping overviews of presentation content to readers, we need to analyze and present presentation context of presentation contents intuitively. To difficulty of present the presentation context, for instance, in order to provide an overview of presentation slides, we adopt a word cloud visualization of presentation slides that words related to the context are important; and we also visualize presentation slides in a structural layout. In this way, it can help readers interactively and easily grasp overviews of presentation content well.

In Chapter 2, in order to position our research comparing with others and show the value of our research, we overview related work.

In Chapter 3 and Chapter 4, we describe methods to support for slide retrieval to readers or searchers by utilizing semantic relationships between slides. Concretely, we measure semantic importance and relationships with semantic relations between keywords and document structure in presentation contents; i) scene combination for slides with recorded videos and ii) semantic ranking and context summarization of presentation slides. As for i), we proposed a method to automatically generate learning channels by using the semantic relations among scenes, which lets users easily focus on either highly detailed scenes or introductory scenes without needing to examine all of the data. In the case of ii), we attempt to rank slides by using the semantics of relationships without relying on the existence of any specific structure in a slide or relevant information between slides. In addition, we consider that retrieved slides also contain irrelevant information to a query. For this, we challenge to generate snippets that capture relevant portions of the retrieved slides as their surrounding context, which help users understand them in presentation contents easily.

In Chapter 5, we show a method to support for slide generation from textbook chapters to presenters or authors by reusing expression styles of existing slides. Although most slides can be automatically

generated by conventional methods follow structured document summaries (e.g. academic papers), we aim to organize slide layouts from target chapters by reusing various styles of referred slides based on level positions of words in the referred slides. To achieve this, we extract differences between tendency of word appearance in chapters and their associated slides (referred slides).

Support for grasping overviews of presentation contents to readers. In Chapter 6, we explain a method to visualize presentation contents by extracting words important to the context of presentations. Here, we focus on how to decide which files are worth learning, because most of presentation contents in search results are similar; it can be difficult to identify differences in them. Therefore, we develop a quick browsing tool provides a word cloud visualization shows the words are interactively presented with visual effects. In Chapter 7, we present a collaborative browsing platform that generates a meaningfully structured presentation by transporting slides. It promotes user interaction and communication and is called the “iPoster.” A collaborative browsing platform based on the iPoster, which can share and navigate information, matches each user's specific requirements by analyzing the users' operations. Further, it detects other users who have similar requirements by mapping the similarity in their operations and conveys their interests to each other.

Finally, we conclude this dissertation and discuss the future direction of the research in Chapter 8.

Scene Combination using Semantic Relations among Presentation Slides with Recorded Videos

We developed a system of automatically generating learning channels for readers to extract scenes and combined scenes from slides with their recorded video based on semantic relations. The system analyzed the type of semantic relation on the basis of the metadata of structural information, such as indents and texts in slides, and the set of keywords in the text of the speech in the video. In this way, our newly generated learning channels let users easily focus on either highly detailed slides or introductory slides without needing to examine all of the data. We described our method and the semantic relations between the scenes and discussed a prototype system. In this case, we could show that there is a possibility to utilize semantic relations analyzed by exploiting heterogeneous media features of presentation contents.

Semantic Ranking and Snippet Generation based on Document Structure and Keyword Semantic Relations

We built a slide retrieval system for searchers involving i) semantic ranking and ii) snippet generation, and we discussed how to present the retrieval results to users by considering what rank orders of the slides related to a query and what portions of the slides are relevant to the query, on the basis of the relationships between slides. These methods are based on the keyword conceptual structure of the semantic relations that implicitly exist between keywords, and the document structure of the indent levels in the slides. With our novel i) slide ranking method and ii) snippet-generation method, not only precise retrieve target slides but also the semantic ranking of them, thus ranking either highly detailed slides or

generalized slides in an order to help users easily learn through slides; and the relevant portions of them in the presentation by focusing on portions from either detailed or generalized slides, thus giving their surrounding context to help users easily determine which slides to learn are useful or not. Finally, we cloud show the effectiveness of our methods that enable the users to browse slide rankings and snippets of the retrieved slides efficiently and effectively.

Outline Generation for Presentation Slides based on Expression Styles

Although most slides generated by conventional methods follow structured document summaries (e.g. academic papers), our method has been designed to generate outlines for lecture slides from textbook chapters. We aimed to organize slide layouts from target chapters based on the expression styles of referred slides by presenters or authors. Therefore, we analyzed level positions of words in the referred slides and arranged words from target chapters to generate slide outlines based on difference in document structure (i.e. text structure within a chapter, slide structure within a slide). To achieve this, we extracted differences between tendency of word appearance in chapters and their associated slides (referred slides). This method generated slide outlines by using the expression styles of the corresponding words from the target chapters in the same layout as that of the referred slides. Finally, we could show the possibility to generate slides outlines by reusing the expression styles of words in the referred slides.

Dynamic Word Clouds: Context-based Word Clouds of Presentation Slides

We developed a quick browsing tool to help readers easily and effectively grasp overviews of presentations. For the purpose, we provided a word cloud visualization that summarizes information to help the users visually understand the context of each presentation. Words important to the ``presentation context,'' is first extracted based on components of the presentation (i.e., slide structure and links between slides). In order to generate word clouds of slides, we weighted extracted words from presentation context, and then presented transitions that highlighted the semantic relationships between slides. Finally, our word cloud visualization could show the words are interactively presented with visual effects in presentations with some application examples.

iPoster: A Collaborative Browsing Platform for Presentation Slides based on Semantic Structure

Recently, zoomable presentations as a substitute to the traditional presentations that allows users to zoom in and out of the presentation media. Then, we built a collaborative browsing platform for presentation slides based on interactive poster generation, called the ``iPoster,'' for presenting elements (i.e., textual and graphic elements) in a meaningfully structured layout with automatic transitions, such as zooms and pans, to promote user interaction. Especially, we introduced a semantic structure analysis model for extracting elements and determining the semantic relationships between the elements of the slides. In order to generate an iPoster to provide an overview of presentation slides, we initially placed the

elements in a tree structure combined with a stacked Venn. We then attached the zooming and panning transitions between the elements, based on the semantic relationship types. Finally, iPoster could enable readers to interactively and collaboratively browse, and understand educational presentations easily and efficiently using their tablets.

Conclusions

In this doctoral dissertation, in order to management of presentation contents, we studied on a structural and semantic analysis of relevant information, structural information, and contextual information from presentation contents. For this, we proposed three approaches: a) we explored semantic relationships inside between slides or scenes; b) we analyzed expression styles of existing slides; c) we presented presentation context intuitively. As a whole, we could confirm our approaches enable us to advance next-generation presentation contents and furthermore to conduct structural and semantic analysis for presentation content management that support for retrieval to readers or searchers, generation to presenters or authors, and grasping overviews to readers.

引用文献

1. “A Browsing Method for Presentation Slides Based on Semantic Relations and Document Structure for e-Learning,” Yuanyuan Wang and Kazutoshi Sumiya, Journal of Information Processing, Volume 20, Number 1, pp. 11-25, December 2011.
2. “Automatic Generation of Learning Channels by Using Semantic Relations among Lecture Slides and Recorded Videos for Self-Learning Systems,” Yuanyuan Wang, Daisuke Kitayama, Ryong Lee, and Kazutoshi Sumiya, In Proc. of the 11th IEEE International Symposium on Multimedia (ISM 2009), pp. 275-280, San Diego, California, USA, December 2009.
3. “A Method for Generating Presentation Slides based on Expression Styles using Document Structure,” Yuanyuan Wang and Kazutoshi Sumiya, International Journal of Knowledge and Web Intelligence, Volume 4, Number 1, pp. 93-112, March 2013.

参考論文

1. “Semantic Ranking of Lecture Slides based on Conceptual Relationship and Presentational Structure,” Yuanyuan Wang and Kazutoshi Sumiya, In Proc. of the 1st Workshop on Recommender Systems for Technology Enhanced Learning (RecSysTEL 2010), pp. 2801-2810, Barcelona, Spain, September 2010.
2. “Slide KWIC: Snippet Generation for Browsing Slides based on Conceptual Relationship and Presentational Structure,” Yuanyuan Wang and Kazutoshi Sumiya, In Proc. of the 9th International Conference on Creating, Connecting and Collaborating through Computing (C5 2011), pp. 40-47, Kyoto, Japan, January 2011.

3. “Skeleton Generation for Presentation Slides based on Expression Styles,” Yuanyuan Wang and Kazutoshi Sumiya, In Proc. of the 5th International Conference on Intelligent Interactive Multimedia Systems and Services (KES IIMSS 2012), SIST 14, pp. 551-560, Gifu, Japan, May 2012.
4. “Dynamic Word Clouds: Context-based Word Clouds of Presentation Slides for Quick Browsing,” Yuanyuan Wang and Kazutoshi Sumiya, In Proc. of the 6th International Conference on Intelligent Interactive Multimedia Systems and Services (KES IIMSS 2013), pp. 108-117, Sesimbra, Portugal, June 2013.
5. “iPoster: A Collaborative Browsing Platform for Presentation Slides based on Semantic Structure,” Yuanyuan Wang, Kota Tomoyasu, and Kazutoshi Sumiya, In Proc. of the 1st Workshop of Quality, Motivation and Coordination of Open Collaboration (QMC 2013), Kyoto, Japan, November 2013 (to appear).