A Narrative Topic Map Visualization to Summarize and Recall a Meeting

Suhyun Lim
Lifemedia Interdisciplinary Program, Ajou University

Chanhee Park
Lifemedia Interdisciplinary Program, Ajou University

Hyunwoo Han
Lifemedia Interdisciplinary Program, Ajou University

Jaejong Ho
Lifemedia Interdisciplinary Program, Ajou University

Junyup Hong
Department of Cyber Security, Ajou University

Soojung Lee
Department of Digital Media, Ajou University

Kyungwon Lee
Department of Digital Media, Ajou University

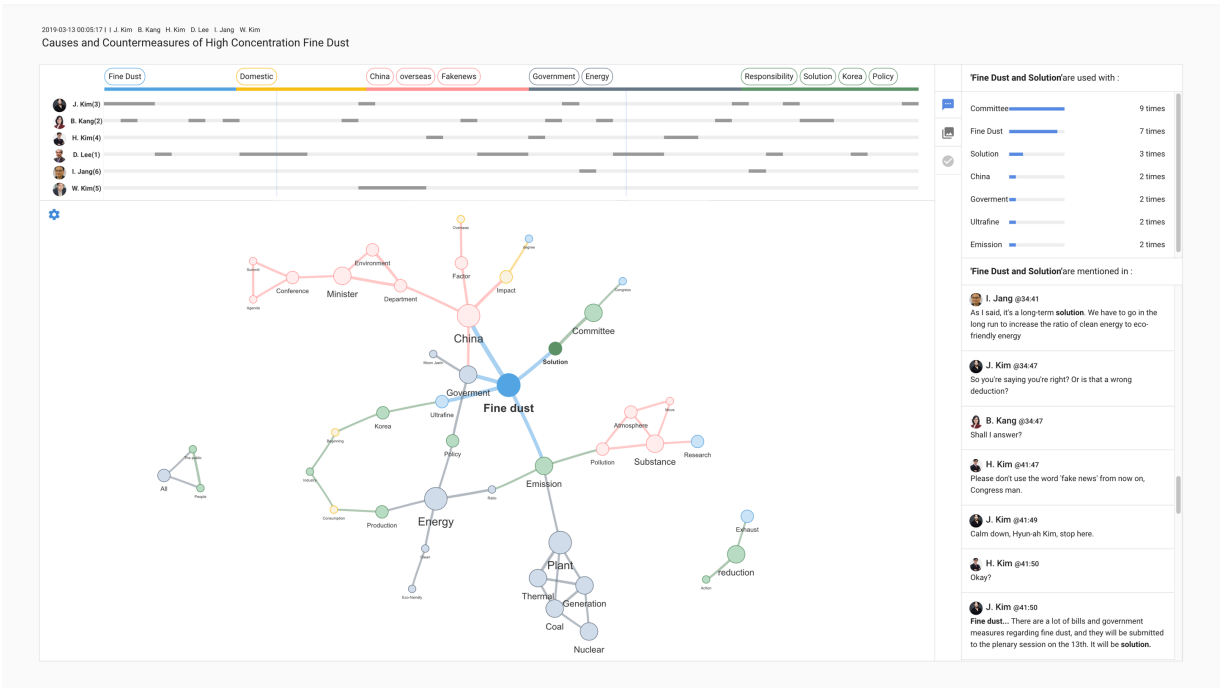

Figure 1: The interface of our visualization system. On the top left, there is a multiple one-dimensional scatter plot that shows speech sections by participants. On the bottom left, there is a topic map that shows the main topics of the meeting and the relationship between them. Users can navigate through the meeting by selecting specific keywords or times. The right side view changes when the keyword or timing is selected. This side view shows related keywords and actual meeting scripts.

Abstract

Meetings are essential in team-based workplaces. Office workers want to check the context of a meeting and the main topics discussed for recall and summaries of meetings. However, there is a lack of studies that can show the topics and contexts of meeting at once. Therefore, this study proposes a visualization interface that shows the topics and context of meetings together. A speech section graph shows the context of a meeting. Further, a topic map provides the main points of the meeting. The visualization and interface design were modified several times to enhance usability through interviews with target users. We expect this system to improve work efficiency.

Keywords: Visual analytics system, meeting summarization, natural language processing, topic map, visual narrative.

Index Terms: H.5.2 [User Interfaces]: User Interfaces—Graphical user interfaces (GUI); H.5.m [Information Interfaces and Presentation]: Miscellaneous

E-mail of authors : {hyun0979, ch13p, ainatsumi, hapsoa, wnsduqdl321, skdufh, kwlee}@ajou.ac.kr

1 Introduction

It is important to review previous meetings for efficient work. Generally, people take notes to record and review a meeting. However, the memo is often subjective and inaccurate. It can also cause side effects where people miss out on other important parts of the meeting while taking notes. These problems make it difficult to summarize and recall a meeting by memo alone [5].

To address these inconveniences, many researchers have suggested automatic methods to record meetings on digital media through audio and video recording [1, 4]. However, this does not provide structural information for the meeting. Consequently, it takes a lot of time to navigate through to the specific meeting section. To solve this problem, several visual interface studies have been conducted to efficiently summarize meeting data recorded on

digital devices [3, 6]. Despite their welcome contributions, there are a lack of studies that can display topics and the context of a meeting together. Therefore, we propose a visualization system that quickly summarizes a meeting and can provide easy recall.

2 Design Goal

To design a meeting summary visualization system, we interviewed four office workers who participated in various meetings. Five discussion times were conducted to set up the requirements and interface design. The common requirements of target users were as follows: first, the main keywords used in the meeting should be shown. Instead of simply listing keywords, the visualization must show the relationship between keywords. Second, the context of the meeting should be easily identifiable. Target users needed narrative information such as "What topics were discussed, who is talking, and when?" Third, the tasks (to do) that occurred at the meeting and the contexts in which they occurred should be navigable.

3 Visual Interface

For this study, the meeting record audio files were used for the main data. The recorded meeting is transformed into a script file by natural language processing. The meeting script is represented by a topic map and a speech section graph. It helps to summarize and recall a meeting. The topic map shows the relationship between the main keywords used in the meeting. The speech section graph shows narratives through meeting sections by participants. Tasks that occur in a meeting are also displayed in the speech section graph. In addition, these visualizations provide user interaction. The user can select a keyword or speech sections to search for a script associated with the item.

3.1 Topic Map

Topic Maps is a network that organizes information according to the relationships of topics as a knowledge map [7]. This is effective in classifying large amounts of information and exploring semantic associations. In our system, the Topic Map summarizing the meeting through the keywords mentioned in the meeting. The size of each topic node is determined by the frequency mentioned. As a result, a large node can be considered the main topic of the meeting and the thickness of the edge is determined by the frequency with which the two keywords are mentioned together in each conversation sentence. In other words, the more interrelated the nodes are, the thicker the edge. This thickness of edges allows users to understand the relationship between keywords. For example, [Figure1] shows a topic map of a meeting. This shows that the meeting is focusing on 'Fine dust' and is discussing 1. industry ('Energy', 'Plant'), 2. politics ('Minister', 'China'), and 3. solution ('solution', 'reduction').

3.2 Speech Section Graph

At the top of the screen, there is a bar chart that provides meeting agenda information, as shown in [Figure2]. The Agenda section is provided in a form that contains the start and end times in the meeting data. Each agenda has a different color and the color of the node in the topic map is the color according to these agendas.

To recall a event, the information should be provided in a context [9]. The speech section graph provides this context. This voice section graph is represented as a one-dimensional scatter plot. This graph darkens the section where each participant talks. The agenda bar chart and participants speech scatter plots provide a context of the meeting over topics (what), participants (who) and time (when).

4 Discussion

Recently, a variety of visualization systems have been proposed to increase the efficiency of the meeting. The MeetingVis use a visual narrative-based approach to meeting summarization [8]. This helps to summarize and recall meetings through the narrative of

Figure 2: The agenda Bar Chart and the speech section graph. This informs the roles and interests of each participant. For example, W. Kim is interested in the external cause of fine dust. Moreover, it shows what participants need to do when the user hovers the mouse over the task, which is indicated by a light blue line.

meetings. TalkTraces is a visual analytics system that helps users identify themes and obtain a sense of agenda in their meeting [2]. It is not only real-time visualization, but it also focuses on team-based use. Therefore, It assists to change or enhance the views of participants during meetings. In a further study, we will take advantage of these studies, and design visualizations that will help summarize the meeting and gain a new perspective in real-time. We will also propose a more effective visualization system by showing the contents of previous meetings related to the ongoing meetings.

5 Conclusion

This study proposes a visualization system to summarize and recall a meeting easily and quickly. This system presents the main points of discussion through the visualization of the topic map for an easy and objective summary of the meeting. It also proposes a Speech Section Graph developed for the quick recall of meetings. The system also supports the navigation of specific meeting segments and topics through user interaction. In future studies, we will improve the system by summarizing the meeting and showing of previous relevant meetings in a real-time. We will also verify if this system is effective in its summaries and recall of the meeting compared with notes and recorded video.

References

[1] B. Arons. Speechskimmer: a system for interactively skimming recorded speech. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 4(1):3–38, 1997.

[2] S. Chandrasegaran, C. Bryan, H. Shidara, T.-Y. Chuang, and K.-L. Ma. Talktraces: Real-time capture and visualization of verbal content in meetings. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, p. 577. ACM, 2019.

[3] M. El-Assady, R. Sevastjanova, B. Gipp, D. Keim, and C. Collins. Nerex: Named-entity relationship exploration in multi-party conversations. In *Computer Graphics Forum*, vol. 36, pp. 213–225. Wiley Online Library, 2017.

[4] A. Girgensohn, J. Boreczky, and L. Wilcox. Keyframe-based user interfaces for digital video. *Computer*, 34(9):61–67, 2001.

[5] A. Jaimes and J. Miyazaki. Building a smart meeting room: from infrastructure to the video gap (research and open issues). In *21st International Conference on Data Engineering Workshops (ICDEW'05)*, pp. 1173–1173. IEEE, 2005.

[6] V.-A. Nguyen, Y. Hu, J. Boyd-Graber, and P. Resnik. Argviz: Interactive visualization of topic dynamics in multi-party conversations. *Proceedings of the 2013 NAACL HLT Demonstration Session*, pp. 36–39, 2013.

[7] H. H. Rath and S. Pepper. Topic maps: introduction and allegro. In *Proceedings of the Markup Technologies*, vol. 99, pp. 7–9. Citeseer, 1999.

[8] Y. Shi, C. Bryan, S. Bhamidipati, Y. Zhao, Y. Zhang, and K.-L. Ma. Meetingvis: Visual narratives to assist in recalling meeting context and content. *IEEE transactions on visualization and computer graphics*, 24(6):1918–1929, 2018.

[9] E. Tulving. *Episodic and semantic memory*. 1972.