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Supporting Exhibition Site Discussions by a Topic-Based Audio Capture System

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Abstract

We introduced a topic-based audio capture system that supports presenters and participants at exhibitions, such as poster sessions at academic conferences, in order to clarify the continuous flow of discussions that are asynchronously generated by presenter or participants. In order to create discussion histories on multiple topics in one session, we developed a simple push-button device and implemented a prototype system that enables the remarks of a participant to be captured as audio segments of ongoing discussions. The proposed system can help participants to more easily explore a particular topic. In the present paper, we describe the concept behind the proposed system and introduce a prototype system.

Keywords: discussion support system, meeting capture, topic-aware interface, interaction design

1   Introduction

Face-to-face discussions at exhibition sites are important in order for presenters to develop ideas and consider comments from various viewpoints in an interactive environment with participants. Moreover, it is useful for participants to learn about trends in their fields of research and to obtain in-depth knowledge in these fields.

However, there are a number of problems with exhibition sites from the perspective of efficiency of communication. For example, the presenter may have difficulty in avoiding having to answer the same question from several participants, because the presenter is engaged in a discussion with the general public, and so it is often difficult to further the discussion on their research. On the other hand, participants may have difficulty in obtaining sufficient explanations from the presenter and lose his/her say because of the environment of the crowded conference room. The above-mentioned problems are factors that make communication among presenters and participants inefficient.

We herein propose a sequential capture technique to capture an asynchronous, concentrated conversation exchanged at the exhibition site and to present it efficiently to participants with a structure based on the conversation topic. In addition, we propose a capture interface that considers a crowded site based on the proposed technique for supporting efficient communications by, for example, reducing the repetition of identical questions and increasing the opportunity for participants to enter the discussion based on a more detailed understanding of the discussion. In the present paper, we describe the proposed concept for supporting discussions at an exhibition site and the system requirements for implementing the proposed system. We then propose a system that enables the creation of discussion histories on multiple topics, using a simple push-button device and implement functions that capture segments of ongoing discussions. The proposed system can help participants to more easily explore a particular topic and remark on it. The proposed discussion support environment and the simple push-button device are described. Finally, we present conclusions and discuss future research.

2   Present Approach

2.1   System Design

In a demonstration at an exhibition site, generally, a few presenters and participants face each other and discuss a particular topic. In this case, the presenter usually engages in a conversation with a few participants just in front of him/her. Participants leave and join the discussion freely. Generally, participants at the front of the group leave after they are finished with the discussion, making room for the other participants to move forward to engage in the discussion.
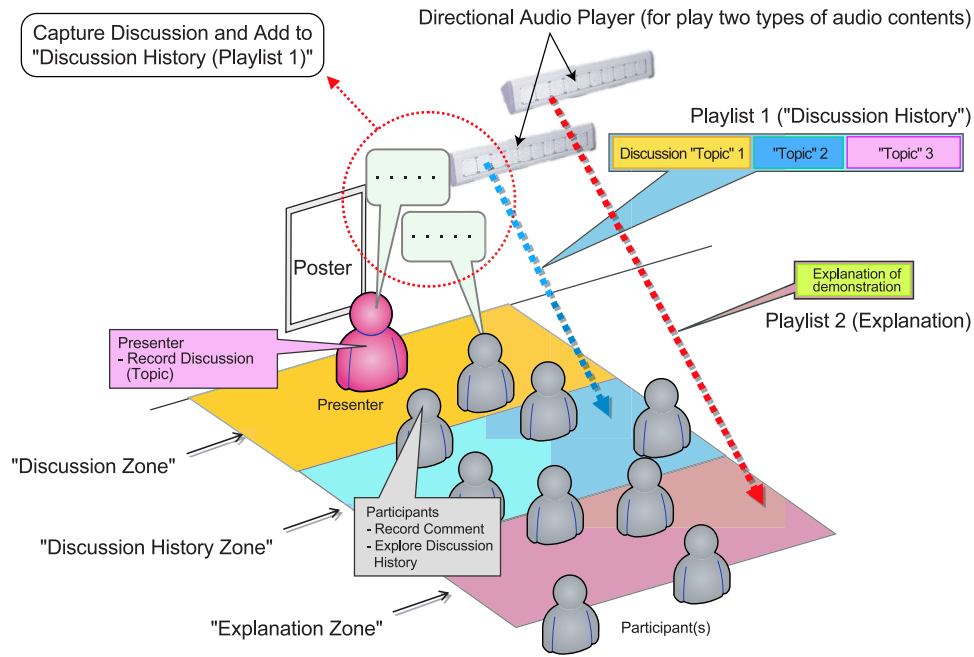
Figure 1. System Design

We focused this on "queue" form in discussions with the general public, and we designed a support system to allow the sharing of discussion histories. Figure 1 shows the proposed approach. We divide the demonstration site into three regions based on the distance between the presenter and the participants. The Discussion Zone, shown in Fig. 1, is the region in which participants can communicate face-to-face with the presenter. The Discussion History Zone is the region in which the discussion of the participants in the Discussion Zone can be heard, even in a crowded room. The Explanation Zone is the region located behind the Discussion History Zone, and the participants in this region cannot easily hear the discussion of the presenter and the other participants when the site is crowded.

The approaches for supporting the participants are different in each of the three regions that can be divided according to the distance between the participants and the presenter. In the proposed system, in the Discussion Zone, the conversation between the presenter and a participant is assumed to be captured, and each captured audio segment in this region is stored as a Topic. In the Discussion History Zone, participants can hear structured discussion histories based on the Topic. Participants can consider remarks related

to a specific Topic of a discussion history until the participant can wither enter the discussion or leave the presentation area. In the Explanation Zone, shown in Fig. 1, participants who have just joined the discussion can only listen to the explanation. In the Explanation Zone, new participants can hear explanations related to a presentation, even if the presenter is inaudible due to the congestion of the room. In the next section, we describe the requirements for the implementation of the proposed system.

2.2 Constitution

To implement the above-mentioned concept, the following technical requirements must be met:

i. Microphones for capturing the discussion between the presenter and the participants in the Discussion Zone

ii. Microphones for capturing the messages from participants in the Discussion History Zone

iii. A user interface for controlling a discussion history that is being played by a participant to enables on-demand listening

iv. Broadcasting of audio contents to Discussion History Zone and Explanation Zone

shown in Fig. 1 without interference

To implement requirements i and ii, we use USB microphones and software to enable multiple audio signals to be captured. In addition, a microphone with directivity is used in consideration of the potential for noise at the exhibition site. In addition, for requirement iii, we developed a simple button interface. For increased usability, requirements ii and iii can be integrated into a single hand-held device. The prototype device is described in Section 3.4.

To implement requirement iv, we use Aimulet [1], which translates infrared radiation emanating from the exclusive transmitter into an audio signal. This device has strong directivity, so suitable our concept of changing audio content based on distance between participants and presenter. Figure 2 shows Aimulet's transmitter, the receiver, and an example of their use. The receiver is compact and non-intrusive because there is no need for controlling the receiver to listen to the audio contents. Participants can listen to explanation contents and discussion histories simply by using the earphones connected to the receiver.

2.3 Scenario

The proposed system was designed for use at an exhibition site. When a presenter engages in a new argument with a participant, the presenter records the discussion by pushing the record button of the microphone system. When the discussion with the participant ends, the presenter pushes the record button again to halt the recording. Thus, the first discussion topic of the poster session is generated. After the recording of the first topic in the session is complete, the system enables each button device and allows the discussion contents to be played automatically.

As the exhibition site becomes more crowded, and while the presenter and participants are engaged in a discussion, arriving participants can listen to an explanation of the presentation using the Aimulet receiver in the Discussion Zone.

As participants leave the discussion, new participants can approach the presenter and enter the Discussion History Zone. In this zone, two or more Push-Button devices are set up. Using these devices and the Aimulet receiver, participants can listen to the history of the discussion. The participants can listen to segments of
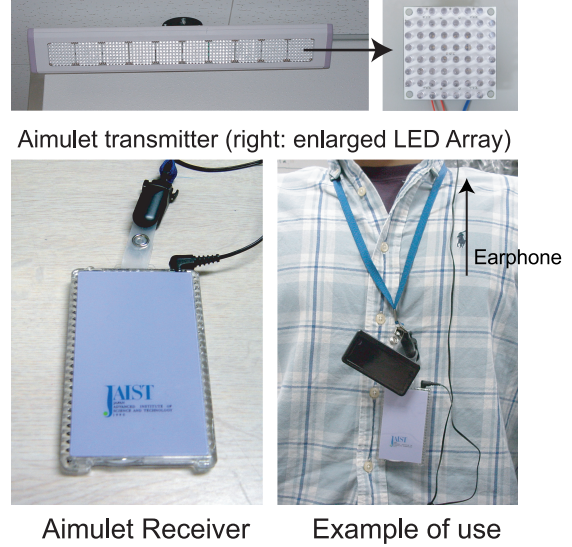

Figure 2. Audio device (Top: Aimulet transmitter Bottom-left: Aimulet receiver, Bottom-right: Example of use)

interest by using the "skip" function of the controller. Participants can add comments to previous discussion segments using the record button. These comments are associated with the applicable topic. The participant can then choose to enter the discussion or leave the presentation area. As this process is repeated, discussions at the exhibition site are merged according to each topic. The opportunity for participants to enter the discussion will therefore increase, making the discussion more efficient.

3 Implementation

3.1 Discussion Contents

In the present paper, the term Topic refers to a unique discussion started by the presenter and the participants in the Discussion Zone. In addition, the term Comment refers to an audio segment recorded by a participant in the Discussion History Zone using the proposed device. The Segment is a unit of discussion between the presenter and a participant and includes a Topic and a Comment. The Discussion History is the entire set of recorded segments stored during a session.

3.2 System Outline

The prototype system consists of seven components: a Push-Button Manager, an Event Manager, a Recording Manager, a Contents Database, an Update Manager, and a Contents-
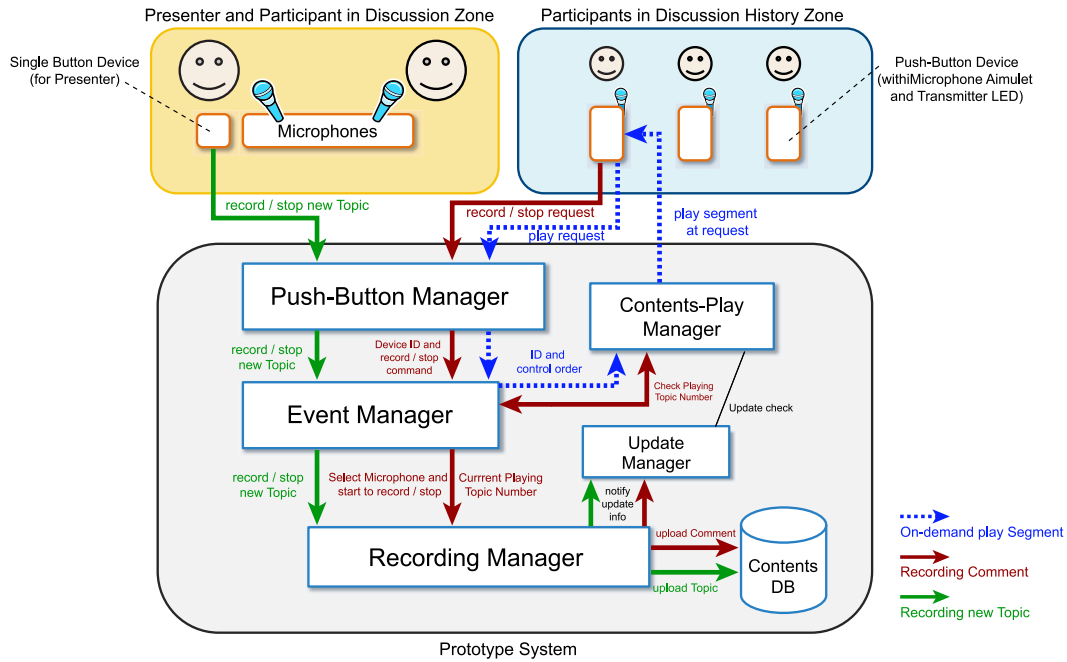
Figure 3. Process Flow

Play Manager. Figure 3 shows an outline and the process flow of the proposed system.

The Push-Button Manager is programmed in JDK5.0 with an RXTX [1] serial I/O library supporting communication between the PC and an RS232C device. In addition, we employed MySQL4.1 for Contents Database. Each component runs on a consumer-grade PC (2.8-GHz Pentium 4 with 1 GB RAM) running Windows XP.

The Push-Button Manager handles inputs individually from Push-Button Devices for participants and sends the inputs to the Event Manager. Inputs from the Push-Button Devices can be classified broadly into playing and recording commands. The Event Manager receives orders and device IDs from the Push-Button Manager and handling applicable function. When the order is record/stop commands, the Event Manager calls Recording Manager to record/stop a segment. When the order is control playing discussion archive commands enables user on-demand listening to discussion history (described in detail in Section 3.4), the Event Manager calls Contents Play Manager to play a segment depending on request of participants.

The Recording Manager records two types of discussion: Topics and Comments (recorded by

participants). When creating a new topic, the Recording Manager records and mixes down the signal lines of the microphone for the presenter and the microphone for the participants (interpellator) in the Discussion Zone. In the case of recording from a Push-Button Device, the Recording Manager records a single line. In both cases, recording continues until a stop command is received from the user. When a recording had finished, the Recording Manager adds the recording to the Contents Database as an MP3 file and associated meta information, such as the topic number of the content playing at that time, the Push-Button Device ID, and the recording date. In addition, when a presenter create a new topic, the Recording Manager notifies the Contents-Play Manager that a new topic has been created.

The main function of the Contents-Play Manager is controlling the playback of audio contents and playing order based on the relation to the discussion segment. When a first discussion topic is recorded by the Recording Manager, the Contents-Play Manager sends play command to the Aimulet transmitter. Then, the Aimulet transmitter on Push-Button device starts to repeat the discussion history. If the Contents Database is updated with new segment, the Contents-Play Manager receives the updated dis-
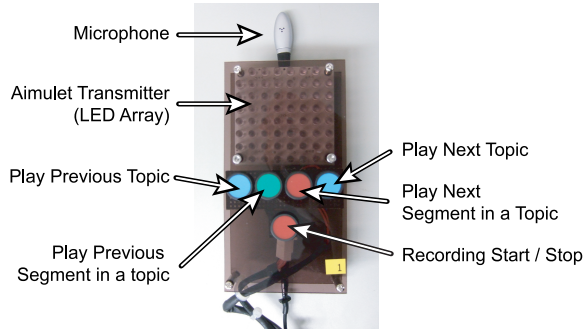
Figure 4. Push-Button Device

the time.

Figure 5. Control playing discussion by Push-Button Device

cussion contents through the Update Manager, and edits the play order of the discussion history by topic according to the new segment.

3.3 Topic-based Audio Segmentation

The proposed system presents a structured Discussion History to the participants as a way of changes play order of discussions in Aimulet transmitter, as shown in Fig. 4. For example, when discussion histories are in the order of "A" (Topic A) - "B" (Topic B) - "C" (Topic C), the proposed system plays discussion histories in order, i.e., A - B - C, and then repeats playback.

When a new Comment "D" is added to associated topic "A" by a participant using the Push-Button Device, the system changes the play order of Aimulet to be A - D - B - C in the order corresponding to the grouping of the topic, and play in the order of A - D - B - C on the next repeat.

For the presenter, as previously noted, the proposed system provides a single button device to record a new Topic. The Contents-Play Manager adds new Topic to last number of the playing order.

To associate a new comment with a topic, we referred to the technique for recording specifying a related message proposed in ChaTEL [5] which is voice chat system allows multithreaded voice communication. A Event Manager in fig.3 gets current topic playing in Aimulet transmitter from Contents-Play Manager, and associate with it when a participant inputs. The Contents-Play Manager acquires the topic number of the playing Segment from Contents DB when a participant starts to record using the Push-Button Device. When a new Comment is recorded, the proposed system uploads the Comment and associates it with the Topic participants listening at
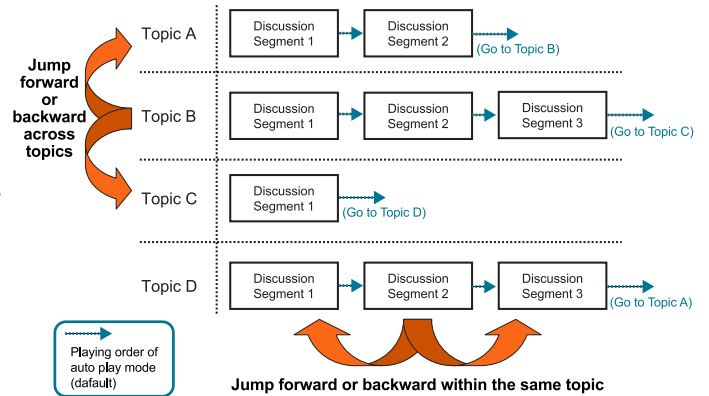
3.4 Push-Button Device

The Push-Button Device consists of an Aimulet LED array, five buttons that enable the user to control playback of the discussion archive, and a USB microphone for recording comments from the participant. Figure 4 shows the proposed Push-Button Device. User inputs of the Push-Button Device are processed by a Microchip PIC 16F877A microcontroller and are sent through an RS232C interface to the PC.

The button located in the center of the device is the Record button. The Record button is a toggle button that starts recording the discussion when clicked and then stop recording when pressed again. The four buttons above the Record button have control playing discussion archive function. The right and left outer buttons are the Play Next Topic and Play Previous Topic buttons, respectively. These buttons can be used to jump forward or backward **across topics** to play a discussion segment.

The right and left inner buttons are the Play Next Segment and Play Previous Segment buttons, respectively. These buttons can be used to jump forward or backward **within the same topic** to play a discussion segment. Participants can hear a discussion history easily in a manner similar to that of a portable audio player. Figure 5 shows an image of these functions.

For example, when a participant is listening to Topic B - Segment 2 in Fig. 5, he/she can listen to Topic C - Segment 1 by pushing the Play Next Topic button, Topic A - Segment 1 by pressing the Play Previous Topic button, Topic B - Seg-

ment 3 by pressing the Play Next Segment button, and Topic B - Segment 1 by pressing the Play Previous Segment button.

4 Related Works

Our approach have a commonality to existing works [2; 3; 4] in the point of supporting conference using archive of remark from each participant with audio data. [2; 3] create records of meeting with audio-visual data automatically by using the capture device composed multiple camera and microphones, and placed in middle of meeting table. Though, these research assumes the situation such as small group participants sit around a table, it is difficult to apply to the conference we assume. [4] supposed "Discussion Mining" system to support face-to-face such as a seminar in a laboratory. Their system generates structured data of the discussion content semi-automatically as multi modal data and enables annotate them by participants for re-useful contents. They use discussion tag system which enables easily tagging about remark: "Question", "Answer" and "Comment" by just holding up tag-device before remarking. Their focus is to crate re-useful contents from meetings by clearfy about relation among each remarks in a meeting based on tagging. While it is different the point of that, our approach intends to incerase the opportunity to remark from participants by enables to aware the continuous flow of discussions in conference.

5 Conclusion and Future Work

In the present paper, we proposed a system that enables the creation of discussion histories on multiple topics using a simple push-button device. The proposed system implements functions that capture segments of ongoing discussions on a particular topic and enables participants on-demand listening to discussion history in exhibition site and remark on it. In addition, we introduce a discussion support environment along with a PUSH-Button Device for use at exhibition sites.

The purpose of the present research is to support effective discussion among presenters and the general public through the sharing of structured discussion histories. Therefore, we plan to evaluate the proposed system with respect to the difference in the amount and quality of participant comments. In addition, we plan to perform comparative experiments to examine the differences of the discussion contents of both groups. We will report the obtained results in a presentation.

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