Visualizing Co-located Conversation Feedback

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Abstract

In this work we describe the iterative design process in the evolution of Conversation Votes, an augmented tabletop visualization that creates new backchannels in collocated interaction. This work presents a reflection of interaction with direct user feedback in the form of anonymous voting. The design of Conversation Votes has evolved as the subtle cues provided in the interface influenced conversation behavior. We discuss how the interface influenced human interaction, and what influenced successive iterations of the interface. Finally, we present the current version of the Conversation Votes table interface.

1. Introduction

Much computer mediated communication has sought to connect remote individuals or groups of people. The focus of this work has been to connect remote individuals to work, laugh, or otherwise communicate [3][4]. With our work, we have chosen to explore computer mediated communication with people co-located about a tabletop [1]. We accomplished this by providing a common reflective display where participants can see a rendering of their contribution to a conversation as well as a rendering of the participation of those around them.

Finding that individuals can view and meaningfully interpret visualizations at a glance while participating in conversation, we are now opening the visualization to allow for direct user feedback through an anonymous voting system [1]. We call this new tabletop interface *Conversation Votes*.

2. Related Work

Anonymous voting has been used on a large scale to determine the desires and feelings of a nation via polls and elections. Anonymous moderation has also been incorporated into online social spaces and forums. One such example is Slashdot which incorporates anonymous moderation to highlight good or funny posts [5].

Shared histogram displays that made contribution level salient in small group settings have been studied by Dimicco [2]. A histogram depicting contribution from each participant was displayed on nearby walls. Utilizing this snapshot of contribution, participants found themselves seeking a balanced conversation. Dimicco continued by developing a suite of conversation visualizations that allowed participants to gain insight into their interaction after the fact. By not presenting the visualizations during the conversation, Dimicco designed the visualizations to be contemplated and examined with the full knowledge of prior experience.

The Conversation Clock provided a real-time and historical visualization of interaction [1]. Providing a persistent history of the conversation, the Conversation Clock produced augmented visual cues of domination, interruption, turn taking, mimicry, etc. Using this visualization, participants reported increased awareness of conversational patterns and found the visualized history revealed patterns that were otherwise undetected.

3. The First Conversation Votes Table

Conversation Votes extends the Conversation Clock visualization by allowing explicit user feedback into the table visualization in the form of participant votes. Participant contribution is rendered on a table to show the current speaking participant, the volume of speech, and gaps in conversation. Each speaker's audio is represented in a different color. The length of each rectangle represents the volume of that participant's speech (see Figure 1). The combined visualization highlights dominance, turn taking, mimicry, and other aspects to provide a third person evaluation of participation.

The visualization further expands on the captured audio features to incorporate the participants' input as they characterize their assessment of whether or not the current speaker should continue or cease speaking. This voting is done via two palm-sized buttons attached to the underside of the table.

The result of the voting is then fed back into the system to augment the visualization. Pressing the positive cue button enlarges the length of the current speaker's rectangular bar, indicating that the audience wants to hear more. Additionally, the fill color of the

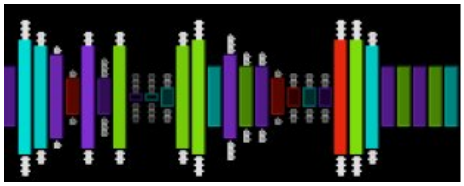

Figure 1. Results of anonymous voting. Some comments were voted up (longer rectangles) while some were voted down (shorter rectangles).

bar is made brighter to reinforce that a vote was made. A negative vote reduces the length of the speaker's bar and causes the color to fade.

As people tested the table, it became clear that there was no indication between no votes and an equal number of positive and negative votes in the representation. To make the distinction clear, we added gray dots at the edges of the rectangles to indicate that voter input had been made. In this case, a standard sized rectangle with multiple dots indicates an equal number of positive and negative votes.

The dots had the added benefit of marking or highlighting moments of activity, contention, and behaving as reference points into the conversation. This addition of the dots was the first iteration that was made on the *Conversation Votes* interface to alleviate confusion. The following section describes the next set of design issues that were encountered following a series of observation sessions.

4. Iterative Design

As mentioned above, the first interface modification was the addition of circular gray dots at the edges of the rectangles to disambiguate between no votes and an equal number of positive and negative votes.

Following another series of observations, the following concerns arose with the interface:

- The voting buttons made a clicking noise, thereby notifying the speaker and the listeners that a vote was taking place. This made the speaker nervous while they were in the midst of a conversation.
- Users kept pressing the buttons until the maximum height of the rectangular bars was reached.
- The impact of the voting was not very evident in the long term. One bar would be altered in size, but it could be imperceptible in the long term unless one watched very carefully.
- A negative vote appeared hurtful. No one wanted to end his or her utterance on a negative note.
- The interface was confusing when several people spoke concurrently.
- People who knew they spoke a lot did not want it made explicit and broadcast for all to see.

3. Design Modifications

The following version of Conversation Votes addressed the above issues. First, the buttons were replaced with silent tap buttons, so that the audio feedback did not interfere with the conversation. Then, a limit was placed on the number of votes allowing only one vote every three seconds to dissuade "ballot-stuffing". Previously, participants continuously voted because their vote affected only one conversation bar. The new interface further discouraged continuous voting by showing the impact of a vote over a period of several bars instead of just one.

The visualization of concurrent speaking was a much used cue in the Conversation Clock. Concurrent speech in Conversation Votes was ambiguous.

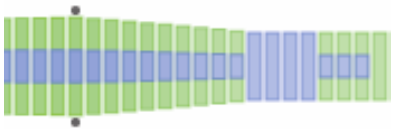

Figure 2. Current voting and speaker rendering. Concurrent speakers are shown with their respective colors. The impact of the voting decreases over time. It also influences the size of the rectangular bars slightly before the moment of voting.

Therefore, we integrated a concurrent speaker rendering into the new version as seen in Figure 2. Now, two rectangles could be rendered in the same time interval.

Finally, we removed the negative voting button and used the positive voting button to highlight moments of significant conversation. Previously, participants became irritated when a negative vote would appear and continued to speak to repair the issue at hand. This was the opposite of the original intended effect of the button.

Formal user studies and design critiques are currently underway with the latest *Conversation Votes* interface. The results of these studies will help determine the efficacy and productivity of such an interface for collocated interaction.

4. References

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