## AnnoDiver: Applying Visual Analytics on Social Annotations to Facilitate Balanced **Research Paper Discourse**

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## Introduction

Prior work has revealed two issues in the use of social annotation as a learning tool for research paper discussion:

- It can be difficult to navigate a large volume of social annotations on a research paper
- 2. Establishing discussions with balanced contributions and diverse viewpoints remains a challenge

To address these issues, we designed a prototype social annotation tool that displays interactive visualizations of annotation threads, and tested the following hypotheses in a user study:

**H1.** The interactive visualizations of the comments will lead learners to explore more annotation threads H2. Displaying the total counts of comments per contribution category will motivate learners to leave comments

System Design	& Features	
Keywords:sounds, 11senses, 6homes, 5versus, 3presence, 3purpose, 3ambient,	interact, 5 communication, 4 passive, 4 togetherness, 4 hears, 4 , 3 audio, 3 shuffling, 3 compares, 3 unique, 3 noises, 3 replica	ate, 3 Social Annotation username: Kevin
work, 3 close, 3 passive togetherness, 2 se	emi-active communication, 2	10 9-
ambient sounds to the audio recording ded soun of random cafes	of their emotional of Others Interacting. In this system, the phone calls of one person would be recorded with their permission. The sounds would then be muffled and distorted to sound like they are coming from another room in the house. They are then played in the opposite household	8- 7- 6- 5-
good way to capture audio versus f their ch many recording devices? vas mear /ing an e	this was hearing hildhood. For P1, iningful because it exciting game. Forat the matched time of day (i.e. if they were recorded at 9AM at one location, they would be played at 9AM at the other location).The Muffle Phone attempts to strike a balance between active and	
actual content of the audio would not be as	passive interactions. We often want to be social and to feel as	Support     self-reflection     alternative     disagreement       Annotation
	169	Sentiments         -0.2         -0.1         0.0         0.1         0.2         0.3         0.4         0.5           ThreadView         ThreadView         Description         Descriptio
		0 (+0.29) (+0.29) (+0.29) This is a great idea. Then the actual content of the audio would not be as important. 0
CSCW '21 Companion, October 23–27, 2021, Virtual Event, US	JSA Hanieh Shakeri, Carman Neustaedter, and William Odom	Add a comment

though we are part of a group, even when we don't want to actively engage in interactions. Conversely, witnessing others interacting without having the means to join in could perhaps make the remote person feel as if they are missing out. Future design research could further explore how group ambience can be used to create a sense of belonging for people who are distance-separated from their social groups. The <b>Sentiment Tuner</b> (Figure 2) draws from a few different categories of togetherness sounds, including <i>Sounds of Existence</i> , <i>Location/Distance Sounds</i> , and <i>Personally Meaningful Sounds</i> . This	<ul> <li>Yasamin Heshmat, Carman Neustaedter, and Brendan DeBrincat. 2017. The autobio-graphical design and long term usage of an always-on video recording system for the home. In Proceedings of the 2017 Conference on Designing Interactive Systems. 675–687.</li> <li>Tejinder K Judge and Carman Neustaedter. 2010. Sharing conversation and sharing life: video conferencing in the home. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. 655–658.</li> <li>Tejinder K Judge, Carman Neustaedter, Steve Harrison, and Andrew Blose. 2011. Family portals: connecting families through a multifamily media space. In Proceedings of the SIGCHI Conference on Human Factors in Computing Cao. 2010. Home video communication: mediating 'closeness'. In Proceedings of the 2010 ACM conference on Computer supported cooperative work. 135–144.</li> <li>Danielle Lottridge. Nicolas Masson and Wandy Mackay 2009. Sharing empty moments:</li> </ul>	Comment type: Support v Submit 0 0 1 0 1 0 1 0 1 0 1 0 1 0 0 1 0 0 1 0 0 1 0
Key Term Frequency List	Sentiment Axis	Comment Category Chart
<ul> <li>A quickly digestible synthesis of peer commentary</li> <li>Navigable feature allows the user to explore and locate comments of interest</li> </ul>	<ul> <li>Displays the distribution of the sentiments conveyed in the paper annotation comments (user's own are in blue)</li> <li>Allows the user to navigate annotations by sentiment</li> </ul>	<ul> <li>Interactive bar chart that displays the comment counts in each of the four contribution categories</li> <li>The user's own contributions are distinguished in solid color to help the user to keep track and compare</li> </ul>

## Evaluation

We conducted a user study with 8 participants, who were separated into a

Quantitative Comparison Between Group Averages

control group (no visualization features) and an experimental group.

During 45-minute Zoom sessions, each participant was asked to complete two tasks as they read a short paper that we seeded with 25 comments:

- **1.** Create at least three comments
- 2. Find three different viewpoints presented by the paper or discussed in the social annotations

For HI, our quantitative results indicated some promise in that the experimental group tended to explore more annotations threads\*. We found no support for H2, although the visualizations seemed to have led to an increase in the creation of comments\*.

\*not statistically significant



## Acknowledgments

This work was produced as the final project for CS 347 (HCI Research) at Stanford University. We thank Dr. Maneesh Agrawala and the teaching assistants who provided feedback on our project, as well as our classmates who participated in our study.