CollabAll: Inclusive Discussion Support System For Deaf and Hearing Students

Anthony Peruma [1]
axp6201@rit.edu
[1] Department of Software Engineering
Rochester Institute of Technology
Rochester, NY, USA

Yasmine N. El-Glaly [1,2]
yasmine@se.rit.edu
[2] Department of Computer Science
Faculty of Science, Port Said University
Port Said, Egypt

ABSTRACT

Even with advances in technology, group meetings between hearing and deaf and hard-of-hearing (D/HH) students can be challenging for all participants. This paper introduces CollabAll, a system that aims to better facilitate productive meetings between D/HH and hearing students. CollabAll provides D/HH individuals with a mechanism to actively participate in making decisions and getting their point across in team meetings. CollabAll enables every team member to create discussion topics for their meeting, track the person currently communicating and the current topic being discussed along with providing a mechanism for 'polite' interruptions. Early feedback from participatory design and focus group studies indicated a positive user experience.

CCS Concepts

•**Human-centered computing** → **Accessibility systems and tools;** *Collaborative and social computing systems and tools; Participatory design;*

Keywords

Deaf; Meetings; Mixed Groups; Turn Taking; Discussions

1. INTRODUCTION

Modern educating practices promote the need of having inclusive classrooms over specialized classrooms for the education of Deaf or Hard of Hearing (D/HH) students [1]. As such, universities provide American Sign Language (ASL) Interpretation services for students in the classroom, with an interpreter facilitating communication between D/HH students and the educator. For most part of the lecture, communication is one-way (from educator to the classroom). However, as part of the course content educators incorporate group projects and activities into the syllabus; with groups usually comprising of a mix of D/HH and hearing students.

As claimed by Stinson et al. [10] in their study of interactions between D/HH and hearing students, D/HH students

are disadvantaged by mixed group activities as it involves discussions and collaboration between multiple individuals, most of whom are not skilled in ASL interpretation. Some of the key issues that have been noticed during group activities include: (1) Multiple students speaking at the same time, (2) No set meeting agenda/structure, and (3) Deaf cultural insensitivity. D/HH students are disadvantaged at meetings with hearing students since a D/HH student would need to keep track of the person communicating, the interpreter, and interruptions. This leads to the D/HH student missing out on the discussion and also finding it difficult to interrupt the person currently speaking.

To provide a more inclusive environment for D/HH students in meetings, we propose our novel system, CollabAll, to break the barriers that prevent D/HH and hearing students from collaborating productively and equally.

2. RELATED WORK

Prior research has been primarily around textual representation of speech/sound in an educational context. More specifically, the works focus on auto generation of caption and transcripts [7, 6] as well as automatic speech to text translation [8]. However, the studies do not touch upon face-to-face group meetings, where there is a possibility of multiple people speaking at the same time. Additional research in this area includes the integration of multiple visual sources for seamless content delivery [2, 9, 4, 3]; some of which also includes the use of commercial products such as Adobe Connect[1] to aid in content delivery. These research works were mainly limited to improving the visual attention of the consumer, and as such did not investigate effective face-to-face group collaboration. Further, using such systems for small (ad-hoc) meetings is not cost-effective due to the required infrastructure and prior setup.

3. CollabAll SYSTEM AND INTERFACE

CollabAll is built as a responsive web based system[2], each participant in the meeting has the ability to access the web site using any Internet enabled device. Through the web site, a participant can be added to multiple 'Groups', setup the discussion points for the meeting using 'Cards', customize 'Interjections' for the group's meeting and run and participate in the meeting. A participant can politely interrupt a person communicating (e.g. 'Slow Down!', 'Don't Understand!', etc). As depicted in Figure 1, the 'Meet Now'

---

[1]http://www.adobe.com/products/adobeconnect.html
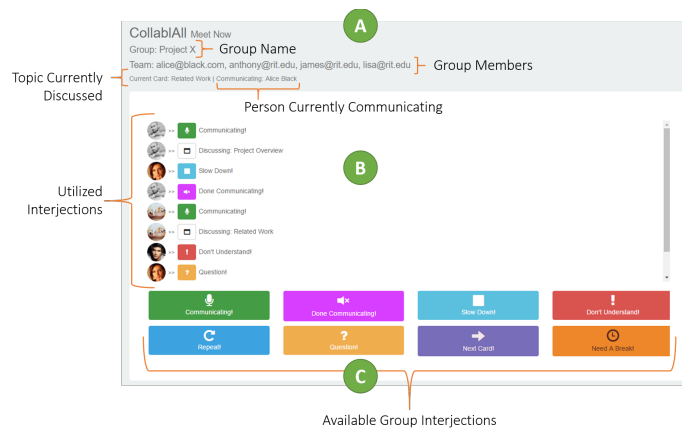[2]https://collaball.github.io/

Figure 1: The CollabAll user interface.

screen is utilized when the group meets. Within this screen, the section marked 'A' contains information such as the group name, members, the person currently communicating and the current topic of discussion. The interjection feed section, marked 'B', contains a feed of 'Interjections' issued by meeting participants. The feed is sorted in chronological order. Next to each 'Interjection' the avatar (or name) of the user will be displayed. The list of available Group Interjections is shown in the section marked 'C'. The 'Interjections' are rendered as buttons, which when clicked, notifies all participants of the interjection. The notifications are instantaneous and appear in the feed. It should be noted that, given the importance of ASL [5], CollabAll does not aim to eliminate the need for ASL or even an ASL Interpreter; it merely supplements the services of an ASL Interpreter.

4. PRELIMINARY USER STUDY

We employed a participatory design approach involving a team of D/HH consultants and life experts to aid in the design of the system. Findings from the participatory design session led to enhancements in the initial prototype.

We evaluated the final design of the prototype in controlled Focus Group studies comprising of five hearing and two deaf students that ranged in age from 21 to 27. In addition to surveys, the studies were monitored by two researchers that observed the group and took notes. Our studies involved having a group of students discuss predefined topics and perform tasks associated with these topics. An ASL interpreter was recruited to facilitate communication. Our observations from the study showed that participants: (1) took turns in communicating and (2) used interjections to convey the need for talking, agreeing, and disagreeing. We also observed that hearing students at times forgot to use interjections; however, the deaf students always used the interjections feature. Further, the deaf students usually took the lead in initiating and discussing activity tasks.

All individuals that we interacted with were asked to complete a survey[3]. Our analysis points to users being satisfied with the effectiveness, intuitiveness and ease of use of the system. We support these findings by qualitative user feedback such as: "Deaf people like me can easily follow along and see who is speaking without feeling lost/confused".

---

[3]https://github.com/CollabAll/survey

5. CONCLUSIONS AND FUTURE WORK

We used an iterative multi-phased approach in designing and building CollabAll. Preliminary studies via participatory design and focus group sessions along with open discussions at meetings and conferences, and researchers observations have demonstrated promising results of the system and also shows the need for such a system.

We plan on conducting a formal and in-depth study of CollabAll in both, controlled and in-the-wild settings, to further understand the effectiveness, shortcomings and improvements of the system.

6. REFERENCES

[1] A. S.-L.-H. Association et al. Inclusive practices for children and youths with communication disorders. 1996.

[2] A. Brando, H. Nicolau, S. Tadas, and V. L. Hanson. Slidepacer: A presentation delivery tool for instructors of deaf and hard of hearing students. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*, ASSETS '16, pages 25–32, 2016.

[3] A. C. Cavender. Using networked multimedia to improve educational access for deaf and hard of hearing students. *SIGACCESS Access. Comput.*, (89):18–21, Sept. 2007.

[4] A. C. Cavender, J. P. Bigham, and R. E. Ladner. Classinfocus: Enabling improved visual attention strategies for deaf and hard of hearing students. In *Proceedings of the 11th International ACM SIGACCESS Conference on Computers and Accessibility*, Assets '09, 2009.

[5] L. Elliot, M. Stinson, J. Mallory, D. Easton, and M. Huenerfauth. Deaf and hard of hearing individuals' perceptions of communication with hearing colleagues in small groups. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*, ASSETS '16, 2016.

[6] R. Kheir and T. Way. Inclusion of deaf students in computer science classes using real-time speech transcription. In *Proceedings of the 12th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education*, ITiCSE '07, pages 261–265, 2007.

[7] W. S. Lasecki, R. Kushalnagar, and J. P. Bigham. Helping students keep up with real-time captions by pausing and highlighting. In *Proceedings of the 11th Web for All Conference*, W4A '14, pages 1–8, 2014.

[8] S. S. Prietch, E. J. dos Santos, and L. V. L. Filgueiras. A mean for communication between deaf and hearing pairs in inclusive educational settings: The sessai app. In *Proceedings of the 12th Web for All Conference*, W4A '15, pages 27:1–27:2, 2015.

[9] J. Reis, E. T. Solovey, J. Henner, K. Johnson, and R. Hoffmeister. Asl clear: Stem education tools for deaf students. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers and Accessibility*, pages 441–442. ACM, 2015.

[10] M. Stinson and Y. Liu. Participation of deaf and hard-of-hearing students in classes with hearing students. *Journal of Deaf Studies and Deaf Education*, 4(3):191–202, 1999.