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Supporting Ad Hoc, Private Conversations at Virtual Conferences

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Online Mingling: Supporting Ad Hoc, Private Conversations at Virtual Conferences

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ABSTRACT

Even though many people have found today's commonly used videoconferencing systems very useful, these systems do not provide support for one of the most important aspects of in-person meetings: the ad hoc, private conversations that happen before, after, and during the breaks of scheduled events—the proverbial hallway conversations. Here we describe our design of a simple system, called Minglr, which supports this kind of interaction by facilitating the efficient matching of conversational partners. We also describe a study of this system's use at the ACM Collective Intelligence 2020 virtual conference. Analysis of our survey and system log data provides evidence for the usefulness of this capability, showing, for example, that 86% of people who used the system successfully at the conference thought that future virtual conferences should include a tool with similar functionality. We expect similar functionality to be incorporated in other videoconferencing systems and to be useful for many other kinds of business and social meetings, thus increasing the desirability and feasibility of many kinds of remote work and socializing.

1. INTRODUCTION

As a result of the COVID-19 pandemic in the spring of 2020, many people learned suddenly (and often somewhat involuntarily) that Zoom, Skype, Facetime, and other videoconferencing systems could be surprisingly good for many kinds of scheduled meetings. These tools are not always as good as meeting in-person, but they are often close, and sometimes even better.

As many people have also experienced, however, there is at least one very important thing that these tools do *not* do well. That is supporting the kind of ad-hoc, private conversations people often have before or after meetings, in the hallway during the breaks of a meeting, or around the office coffee machine.

As the prior research summarized below suggests, these ad hoc, random encounters can be key to creative innovations in cities, research labs, companies, and elsewhere. They can also be critical to forming social bonds and building trust in a group. In fact, we show with a survey that these ad hoc conversations are one of the things people value most about in-person conferences, and we suspect that these interactions are among the things people *miss* most about working from home and attending virtual conferences or other meetings.

However, most people do not realize how straightforward it can be to create videoconferencing software that supports these ad hoc interactions. In this paper, we describe one such simple system, called Minglr, and its first public use at the ACM Collective Intelligence conference (CI 2020) held virtually in June 2020. We also show through the analysis of surveys and system log data that the system was usable and that conference participants found its functionality highly useful.

We believe that, together, this system and our study of its use demonstrate both the surprising simplicity and the surprising value of supporting these ad hoc, private conversations online. We plan to make this system available as open source software, we expect similar functionality to be added to other videoconferencing systems, and we believe that, as these things happen, many kinds of remote work and socializing will become more common.

2. BACKGROUND

2.1 The Importance of Ad Hoc Interactions

Random interactions are critical for creativity and innovation. Such encounters may play a key role in innovation as they expose individuals to new sources of information that can lead to the generation of new knowledge [1]–[4], and breakthrough discoveries often involve unexpected combinations of ideas [5] and new collaborations [6]. For example, research by Boudreau [6] shows that serendipitous, face-to-face encounters among medical researchers during a short 90-minute large-scale information-sharing session resulted in a 75% increase in probability of coauthoring grant applications. Research also shows that various measures of innovation in cities increase superlinearly with the size of a city [7], [8]. For instance, a city that is twice as large as another one has about 15% higher per capita rates of patents, R&D employment, and other measures of innovation. A plausible explanation for this increase is the increase in opportunities for productive, random encounters that larger cities provide. In addition to the direct benefits of information exchange, these random interactions can also have more indirect positive effects by forming social bonds and building trust in a group [9].

Random encounters are also one of the key benefits and desired goals of attending an academic conference. Serendipitous or "chance" encounters at conferences and other gatherings provide individuals with non-routine opportunities for face-to-face interaction and rich knowledge sharing [10]. Researchers have significant freedom in choosing who to collaborate with [11]. However, search costs and frictions introduce significant hurdles in the formation of scientific collaborations [6] and have been blamed for lower rates of innovation, success, and reproducibility [12]. In fact, social interactions between people whose offices are more than a few yards apart are extremely rare [13]–[16]. These results all highlight the potential value of random encounters at a conference, where people from all around the world gather and communicate with one another.

2.2 The Increasing Importance of Virtual Conferences

Two global trends suggest a shift away from large in-person meetings to virtual meetings. First, due to concerns about climate change and efforts to reduce carbon impact, companies and academic institutions are attempting to reduce air travel and offset carbon emissions for unavoidable travel [17]–[19]. For example, Microsoft has committed to cut operational carbon emissions by 75 percent by 2030 [20], and there are direct calls for the academic sector to reduce air travel [21]. Such goals are only possible with reduced air travel which is a major contributor to carbon emissions [22].

Second, global pandemics like COVID19 introduce health risks that make large in-person gatherings impossible. These two trends are furthermore related as climate change acts as a risk multiplier that

makes future pandemics more likely due to the destruction of natural animal habitats and higher temperatures [23].

Together, these two trends suggest why virtual meetings are becoming increasingly common and important. In the last few months, with the coronavirus pandemic, vast numbers of people have learned to use videoconferencing technologies. Tech companies like Facebook and Twitter are leading the way in making the transition to remote work brought about by the coronavirus pandemic permanent [24]. And many academic conferences are now being held online [25], [26].

3. PRELIMINARY STUDY

To evaluate the relative importance for conference participants of different aspects of conferences, we invited members of a broader research and practitioner community that is related to the CI 2020 conference to fill out a web-based survey. (See Appendix A for the text of the survey and the list of mailing lists and social media pages through which we solicited survey respondents.) We received 53 responses to the survey, and all respondents were asked to evaluate in-person conferences. The 30 respondents who said they had attended virtual conferences were also asked to report their experiences with virtual conferences.

Figure 1 and 2 show the key results from the survey. Responses in Figure 1 suggest that the most important aspect of attending in-person conferences are conversations in hallways, lobbies, and at social events. However, responses in Figure 2 indicate that such conversations with other attendees are not very important in virtual conferences, presumably because they are not well supported in current virtual conferences. While the responses for other aspects are similar between in-person and virtual conferences, the average rating of the importance of conversations is significantly lower for virtual conferences than for in-person conferences ($p < 0.001$).

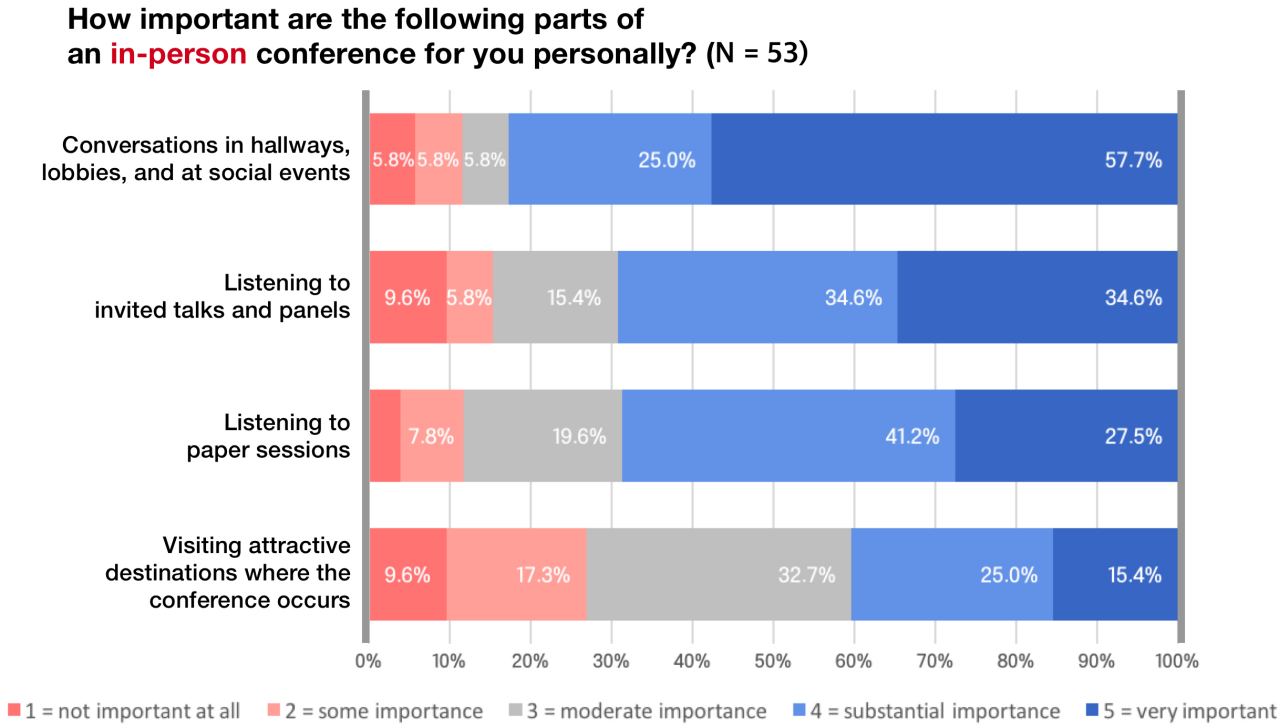

Figure 1. Ratings for value of different aspects of in-person conference

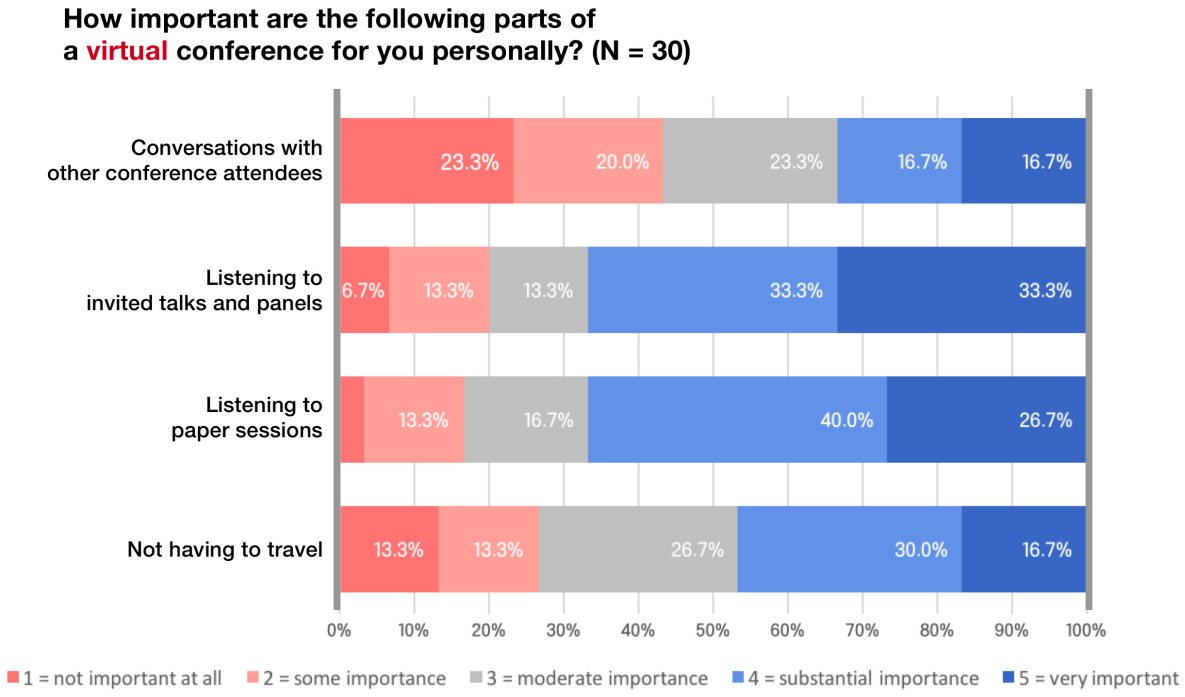

Figure 2. Ratings for value of different aspects of virtual conference

Although these results may not be representative of all conference attendees, they suggest that support for ad-hoc conversations will be critical for virtual conferences in the future.

4. DESIGN OF THE MINGLR SYSTEM

4.1 Design Goals

Our *most important goal* in designing the Minglr system was to support online the kind of informal conversations that happen around the edges of in-person meetings, such as the hallway conversations at in-person conferences. More precisely, we wanted to provide *a platform that would make it very easy for people in an online group to have ad hoc, private videoconferences with other members of the group.*

A *secondary goal* of our design was to provide some functionality that would be *better* than in-person mingling in cases where that could be done easily. In particular, we wanted to take advantage of the non-physical environment to facilitate efficient matching of conversational partners in useful ways that would be difficult or impossible to do in-person.

A *non-goal* of this project was to try to replicate the physical aspects of informal mingling, such as the effect of physical proximity on ability to hear or talk to others. In other words, we did *not* want to try to provide an online environment that simulated details of a physical space with, for example, avatars of people moving around in the space. Instead, we wanted to explore the degree to which the simplicity of abstracting away from these details could provide a more fulfilling user experience.

To evaluate the relative importance for conference participants of different aspects of conferences, we invited members of a broader research and practitioner community that is related to the CI 2020 conference to fill out a web-based survey. (See Appendix A for the text of the survey and the list of

mailing lists and social media pages through which we solicited survey respondents.) We received 53 responses

4.2 System Functionality

Creating a profile. Users first register for the system by either using their Google or Facebook logins or by creating a new account for Minglr using their email address. As soon as they log in, they get an opportunity to edit their Minglr profile to include their affiliation and their research interest keywords. In addition, if Minglr has not already imported a picture of them from their Google or Facebook login, they are able to upload a profile picture of themselves.

Matching conversation partners. As shown in Figure 3, there are three parts in the Minglr interface for matching conversational partners. On the left (part A), users can select one or more people they want to talk to from the list of other people participating in the meeting. A special icon indicates people who are already talking to someone else, but users who want to wait for these people are free to do so. Each time a user selects someone they want to talk to, information about that person and others waiting to talk to that person appears in the middle of the window (part B). On the right side of the window (part C), users see other people who want to talk to them. And when they select one of those names, the two people are placed in a private videoconference with each other (see Figure 4).

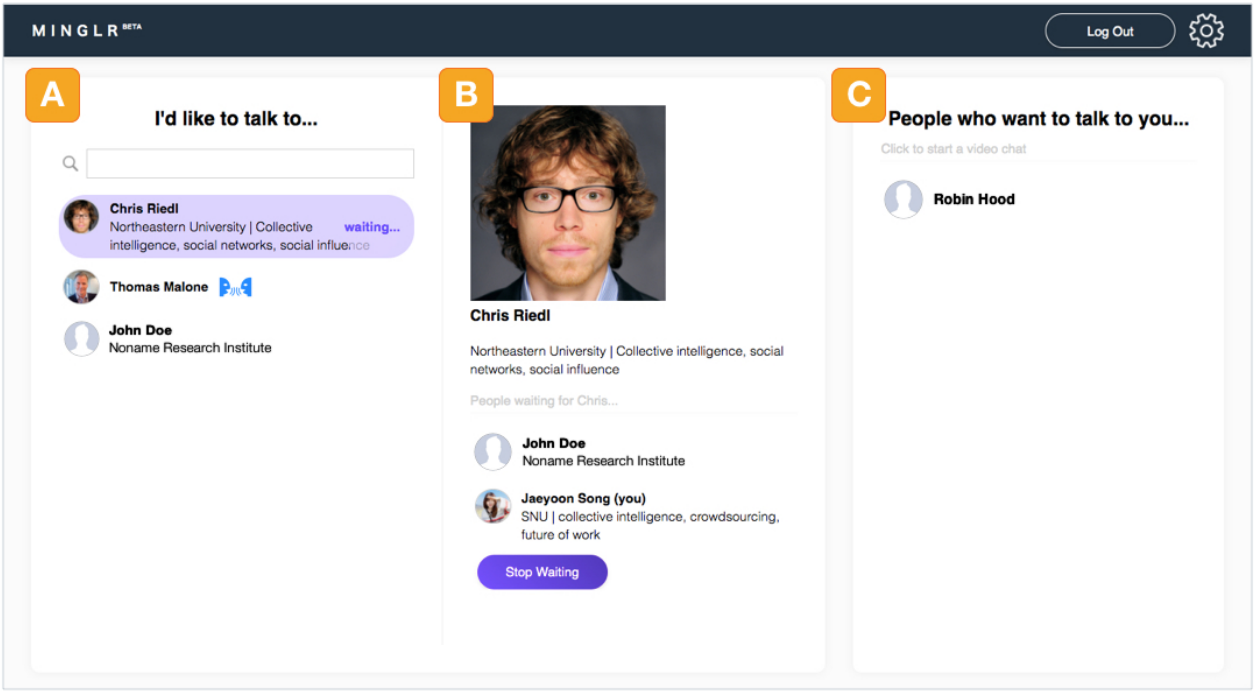

Figure 3. The Minglr Interface - matching conversation partners

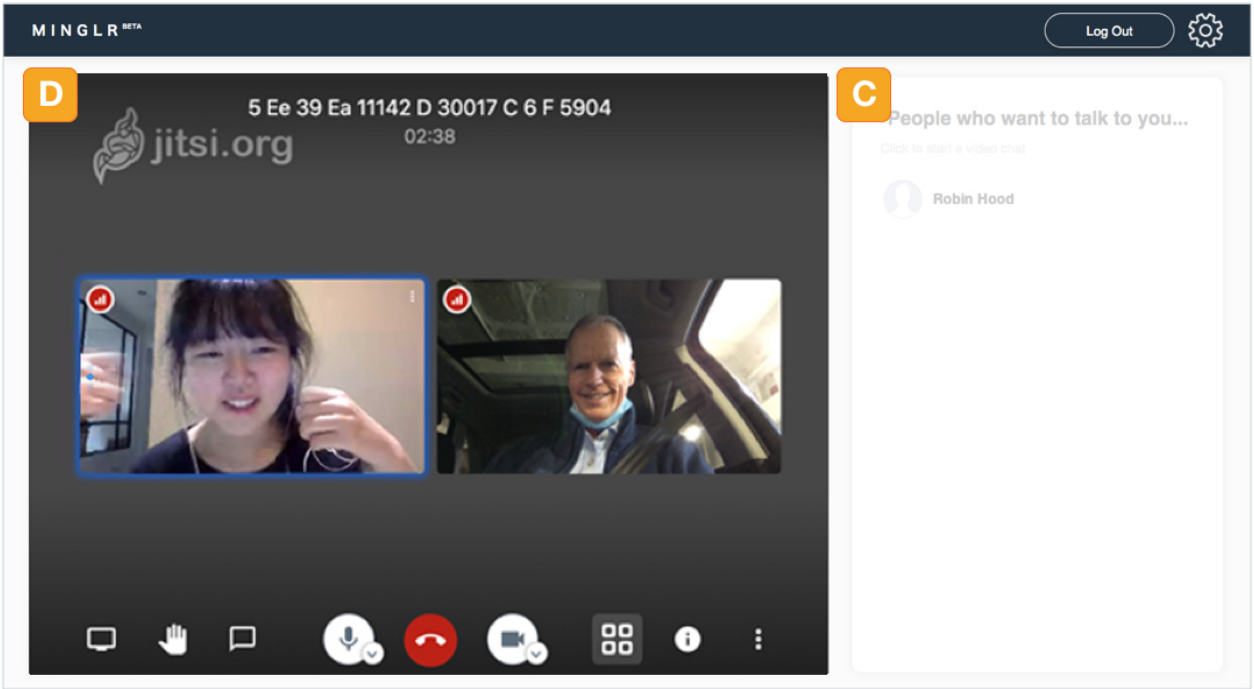

Figure 4. The Minglr interface - supporting private video conferences

Supporting private video conferences. As Figure 4 suggests, users in the private videoconference room (part D) can talk to each other as in a typical videoconference for as long or as short a time as they want. During their conversation, they can also see (part C) a continually updated list of other people who want to talk to them. And whenever either user is ready to end the conversation, they can do so by clicking the "hang up" button near the bottom of the window. Then both users are returned to a screen like the one shown in Figure 3.

4.3 Key Design Decisions

Our basic interface design was inspired by the following simplified observations about how matching of conversational partners occurs in in-person mingling:

– If you want to talk to someone who is not talking to anyone else, you approach them and indicate by eye contact or other body language that you are interested in talking to them. Then they indicate by their own body language whether they want to talk to you. If they reciprocate your interest in talking, then you have a conversation until one of you decides to leave. If the other person does not reciprocate your interest, then you (usually) get the message and move on.
– If you want to talk to someone who is already talking to someone else, you indicate your interest in talking by your body language, usually standing near them, often facing them, and sometimes in an informal line of others who also want to talk to that person.

In Minglr, instead of indicating your interest in talking to a person by your body language, you do so by selecting them in the list shown in part A of Figure 1. Parts A and B also provide you with information that you could get visually in-person about who is already talking to someone else and who else is waiting to talk to different people. Finally, part C gives you information about who wants to talk to you that you could get in-person from body language.

Interestingly, however, we decided to take advantage of the virtual nature of interactions in Minglr to do three things that could not be done as easily (if at all) in a physical environment:

– In a physical environment, you can usually only wait to talk to one person at a time. In Minglr it is easy to wait simultaneously for any number of people.
– In a physical environment, you can sometimes see limited information about a person (such as their name and affiliation) if you can get close enough to them to read their name badge. But in Minglr, you can easily see not only the names and affiliations of anyone else in the group, you can also see any other information they have entered about their interests. Minglr also provides an automatic search function with which you can easily search for people with specific keywords in their affiliation or interests.
– In a physical mingling environment, some people are in more central places than others and so are more easily seen and approached by others [27]. In Minglr, we randomized differently for each person the order in which names appear in part A. If we had, for instance, listed the names alphabetically, then it is likely this would have given more interaction opportunities to people whose names came early in the alphabet.

In the interests of simplicity of the system and data, we did not provide several other features that seem desirable for future versions of the system, including the ability to:

– have more than two people in a private videoconference
– automatically match users with similar interests
– randomly match pairs of users who both want to be matched in this way.

The last two items are particularly intriguing because they have the potential to make online mingling more useful and satisfying than ordinary in-person mingling. However, we decided not to implement these features in this first version of the system because we thought it was even more important for users to have the option of retaining direct control over which conversational partners they interact with.

4.4 Implementation

The Minglr system was implemented as a JavaScript-based web app, and we used a rapid iterative design process of prototyping and pilot studies. Minglr builds upon jitsi, an open source videoconferencing system [28], and Minglr is also available as open source software (see https://github.com/CCI-MIT/minglr).

5. DEPLOYMENT STUDY

5.1 Participants and Procedure

We deployed the Minglr system at the ACM Collective Intelligence conference (CI 2020), a one-day academic conference held on June 18, 2020. Due to the COVID-19 pandemic, this year's conference was held for the first time as a virtual meeting and lasted from 9:00 am to 4:45 pm EST. All the main conference sessions happened in a Zoom meeting, with all attendees except scheduled speakers muted. Sessions with presentations of accepted papers were not part of the live event but were instead presented asynchronously. Pre-recorded video presentations by the paper authors were posted on the conference website so that conference participants could view presentations, download extended abstracts and exchange public and private comments. Our deployment of the Minglr system happened during the live keynote event. A total of 275 unique individuals attended the Zoom meeting over the course of the day (average duration of attendance was 30 min [95% confidence interval: 20-39].

The first session of the conference included a series of keynote presentations, one of which (by Malone) included, among other topics, a description of Minglr. Then conference participants were invited to use Minglr starting in the first break of the conference. The system remained available for their use throughout the rest of the day.

5.2 Data Collection

To better understand how Minglr was used and how its users evaluated it, we collected two kinds of data:

(1) *System usage log*. During the conference, the Minglr system automatically logged all operations the users performed using the system. For example, the log includes each time a user requested to speak to another user, accepted a request to speak, began a conversation, or ended a conversation. The log does not include any aspect of the actual conversations users had with each other.
(2) *Post-conference survey.* After the conference ended, we sent a web-based survey to all conference registrants. The survey included various multiple choice and open-ended questions about the users' evaluations of various aspects of the overall conference and of the Minglr system in particular. (see Appendix B for the complete text of this survey).

All data collection for this study (and the preliminary survey) was determined to be "Exempt" by the MIT Committee on the Use of Humans as Experimental Subjects (project no. E-2306).

6. RESULTS

6.1 System Usage Log

The first scheduled break began and the URL to Minglr was announced at 11:17 am. The first conversation started at 11:19 am. During this break period, a total of 70 conversations occurred. All of these conversations were finished by 12:05 pm as the next keynote session resumed.

During the second conference break (2:15 - 2:45 pm), 3 more conversations occurred, and after the final session (an affiliated workshop) ended at 3:45 pm, there were 7 more conversations. The last conversation ended at 5:13 pm. During the six-hour period, over one third of all conference participants (103) actively used Minglr (i.e., they signed up and had at least one conversation).
The users placed 300 requests to speak with other users, which were matched in a total of 80 dyadic conversations, with a cumulative total of 7.5 hours of conversation time. Users had an average of 2 conversations, with a minimum of 1 and a maximum of 10. The system facilitated an average number of 8 conversations (16 users) during those times when any conversations were occurring. Conversations lasted on average 5 minutes 37 seconds. The shortest conversation was 8 seconds, and the longest was 29 minutes. The average conversation time per user was 15 minutes. The search function was used by 26 users, an average of 2.38 times each. Note that all these conversations were formed on an ad-hoc basis, facilitated by the Minglr matching system. None of them were scheduled or planned in advance.

6.2 Post-conference survey

Of the 275 attendees who participated in the conference, 71 responded to the web survey (a 26% response rate). Based on these results, we observe that the conference attendees were predominantly male and had academic or other research-related professions (69% male, 27% female, 4% preferred not to say; 31% professors, 24% graduate students, 16% employees at research institutes, 7% employees at companies, 6% undergraduate students, and 7% other; numbers do not sum to 100% because of

rounding). The survey included some questions about the overall conference (see Appendix B), but we focus here on the questions specifically related to Minglr.

Use of Minglr. Among the 70 respondents who answered the question "Did you use Minglr?", 29 said yes and 41 said no. Of those who did not use Minglr, the most common reason given for not using Minglr was that they wanted to take a break or do other things (56%). Other reasons chosen were: could not get it to work (12%), were not interested in talking with others (7%), or "other" (24%).

Usefulness of functionality like Minglr. Perhaps the most important question about Minglr is the one shown in Table 1. Since our primary goal was to assess the value of the general functionality provided by Minglr, not the specific details of our current, beta-test implementation of this functionality, this question asks whether attendees agree that "Future virtual conferences should include a tool with functionality like Minglr (to support ad hoc, private video conversations)."

Future virtual conferences should include a tool with functionality like Minglr (to support ad hoc, private video conversations)			
	Did not use Minglr (n=41)	Used Minglr (n=29)	Used Minglr without technical problems (n=14)
Strongly Disagree	0.0%	0.0%	0.0%
Disagree	4.9%	6.9%	0.0%
No Opinion	56.1%	13.8%	14.3%
Agree	36.6%	24.1%	42.9%
Strongly Agree	2.4%	55.2%	42.9%
% Agree + Strongly Agree	39.0%	79.3%	85.7%
% Agree + Strongly Agree (excluding No Opinion)	88.9%	92.0%	100%

Table 1. Desirability of including a tool like Minglr in future virtual conferences.

The bottom two rows of the table show two ways of summarizing agreement with the statement. One is the total percentage of those who "Agreed" and those who "Strongly agreed." The other calculates the same total but excludes those who said they had "No opinion."

As the table shows, a majority (56%) of those who did *not* use Minglr have no opinion about this question. This seems sensible given that they had no personal experience with Minglr. However, of those who did express an opinion (perhaps based on the description of the system in the keynote presentation), 89% said they agreed with the statement.

Of those who *did* use Minglr, the two measures of agreement were 79% and 92%, respectively. It seems likely, however, that those who had technical problems with using Minglr might have formed negative

impressions for that reason, so we also looked at those who used Minglr without any technical problems. For this group, the two measures of agreement were 86% and 100%, respectively.

Of all these measures, we believe the most informative one is the 86% agreement of people who used the system with no technical problems. This measure relies on people who had enough experience with using the system to have an informed opinion about the value of "functionality like Minglr," but who were not negatively influenced by technical problems that arose because of the beta-test status of the Minglr software. This measure also takes into account any possible signal that selecting "No opinion" may be conveying.

We believe that, together, these measures of agreement from the conference attendees strongly support the claim that "functionality like Minglr" can be valuable in virtual conferences.

Satisfaction with various aspects of Minglr. We also measured how satisfied the attendees who used Minglr were with Minglr's various aspects (see Figure 5). The satisfaction score was high (3.79) for "using a novel collective intelligence application," and scores in all other aspects except for learning were higher than 3 (neutral). This suggests that users were at least somewhat satisfied with all aspects of the system except its ability to help them learn more about collective intelligence topics. One potential explanation for why the satisfaction with learning is low could be because people talked primarily about non-technical topics during their Minglr conversations.

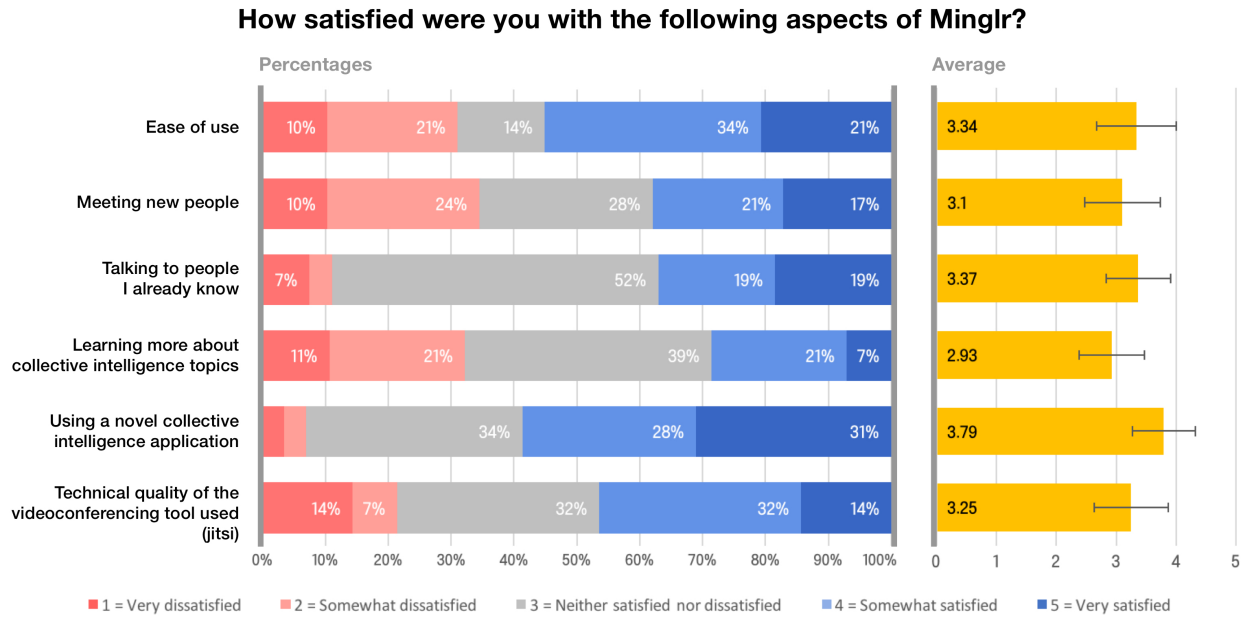

Figure 5. Satisfaction with different aspects of Minglr.

7. DISCUSSION

We believe the most important results of the work reported here are that relatively simple software functionality can support ad hoc, private video conversations and that this functionality can be

surprisingly useful in virtual conferences. For instance, 86% of users agreed that functionality like that in Minglr should be included in future virtual conferences.

We also expect that some version of the basic functionality of Minglr will be useful in many other situations, too, not just academic conferences, but also business meetings, remote work groups, classes, parties, and many other professional and social events. So we expect that some version of this functionality will eventually be implemented in most major videoconferencing systems.

In addition, as described above, we believe that there are several other kinds of functionality that would be straightforward--and desirable--to add to systems like Minglr, including having video conversations with more than two participants and and giving users the option of being automatically matched with other conversational partners based on common interests or purely randomly.

The work reported here also suggests intriguing possibilities for future research, such as how different kinds of users would respond to this kind of functionality. For example, might people who are shy or new to a community find it easier and more satisfying to make connections using functionality like that in Minglr than in in-person settings? Or might automatic matching appeal more to shy and new users and lead to the formation of a separate sub-community within the larger group?

8. CONCLUSION

In this paper, we first showed with a survey that many people find ad hoc conversations one of the most valuable aspects of in-person conferences but one of the least valuable aspects of previous virtual conferences. Next, we presented the design of the Minglr system, a platform for supporting precisely these kinds of ad hoc conversations at virtual conferences and other meetings. Finally, we described the use of this system at the ACM Collective Intelligence virtual conference (CI 2020) and showed via log file data and surveys that attendees found the system both usable and highly useful.

We believe that functionality like that provided by Minglr is likely to be widely implemented in many videoconferencing systems and to increase the feasibility and desirability of many kinds of remote work and socializing.

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APPENDIX A. PRELIMNARY SURVEY

1. Distribution of Preliminary Survey

- Association of Computing Machinery (ACM) Special Interest Group on Computer-Human Interaction (SIGCHI) members mailing list
- ACM Computer-Supported Cooperative Work (CSCW) mailing list
- ACM Collective Intelligence (CI) community mailing list
- ACM SIGCHI Facebook group
- Researchers of the Sociotechnical Facebook group
- Crowdsourcing and Human Computation Google group

2. Questions in Preliminary Survey

(1) I am…
   a. an undergraduate student
   b. a graduate student
   c. a professor
   d. an employee at a research institute
   e. an employee at a company
   f. Other

(2) I am…
   a. Male
   b. Female
   c. Prefer not to say

(3) Do you have experience attending an "in-person" conference?
   a. Yes
   b. No

(4) How important are the following parts of an in-person conference for you personally:
   a. Visiting attractive destinations where the conference occurs
   b. Listening to paper sessions
   c. Listening to invited talks and panels
   d. Conversations in hallways, lobbies, and at social events

(5) Do you have experience attending a "virtual" conference?
   a. Yes
   b. No

(6) How important are the following parts of a virtual conference for you personally:
   a. Not having to travel
   b. Listening to paper sessions
   c. Listening to invited talks and panels
   d. Conversations with other conference attendees

(7) What do you like MOST about virtual conferences?

(8) What do you like LEAST about virtual conferences?

(9) I wish virtual conferences could...

(10) What challenges, if any, have you experienced when socializing at in-person conferences? (e.g., few people approach me since I am a novice in the community)

(11) Do you have any other comments about your experiences, both good and bad, with conferences?

APPENDIX B. POST-CONFERENCE SURVEY

1. Responses to multiple choice questions about the conference overall, not Minglr

For the CI 2020 virtual conference, please rate the value of the following factors for you personally:	
Factors	Average
Not having to travel	3.5
Listening to paper presentations	3.8
Listening to invited talks and panels	4.3
Conversations with other conference attendees	3.5

Table B1. Relative value of different aspects of CI2020 conference.
(1 = not important at all, 2 = some importance, 3 = moderate importance, 4 = substantial importance, 5 = very important)

If you attend a future virtual conference, which option would you prefer for paper presentations?	
Options	%
Live videos (which would mean a longer conference)	37%
Asynchronous videos with online comments (as was done for CI 2020)	41%
No preference	20%

Table B2. Preference paper presentation format in future virtual conferences

2. Questions in Post-Conference Survey

(1) Did you attend the Collective Intelligence (CI) 2020 virtual conference?
   a. Yes
   b. No

(2) I am…
   a. an undergraduate student
   b. a graduate student
   c. a professor
   d. an employee at a research institute
   e. an employee at a company
   f. Other

(3) I am…
   a. Male
   b. Female
   c. Prefer not to say

(4) For the CI 2020 virtual conference, how important are the following factors for you personally:
   a. Not having to travel
   b. Listening to paper presentations
   c. Listening to invited talks and panels
   d. Conversations with other conference attendees

(5) If you attend a future virtual conference, which option would you prefer for paper presentations:
   a. Live videos (which would mean a longer conference)
   b. Asynchronous videos with online comments (as was done for CI 2020)
   c. No preference

(6) Future virtual conferences should include a tool with functionality like Minglr (to support ad hoc, private video conversations).
   a. Strongly disagree
   b. Disagree
   c. No opinion
   d. Agree
   e. Strongly agree

(7) Did you use Minglr?
   a. Yes
   b. No

(8) How satisfied were you with the following aspects of Minglr?
   a. Ease of use
   b. Meeting new people
   c. Talking to people I already knew
   d. Learning more about collective intelligence topics
   e. Using a novel collective intelligence application
   f. Technical quality of the videoconferencing tool used (Jitsi)

(9) Did you have technical difficulties in using Minglr?
   a. No
   b. Yes

(10) What did you like about Minglr?

(11) What did you NOT like about Minglr?

(12) How would you suggest improving Minglr?

(13) If you are willing to participate in a Zoom (or phone) interview about your experiences in using Minglr, please tell us your email:

(14) You received this survey because you were registered to attend CI 2020, but you just said you didn't attend. What was the reason?
   a. You tried to attend but were unable to because of technical difficulties
   b. Your plans changed, and you needed to do other things
   c. Other

(15) Why didn't you use Minglr?
   a. I couldn't get it to work
   b. I wanted to take breaks or do other things
   c. I wasn't interested in having conversations with other conference attendees
   d. Other