“Meta Hybrid” Visioning Activity Report Out

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Background and Information

From the early days of the field, conferences have played an outsized role in computing research. Decades ago the Computing Research Association (CRA) led the charge to recognize that for computer scientists, conference publications can be just as significant as journal papers in other fields. The evaluation of computer science and engineering faculty for promotion and tenure has generally followed the dictate “publish or perish,” where “publish” has had its standard academic meaning of “publish in archival journals”. Qualifying journal publications as the sole determinant of scholarly achievement, and relying on such publications to identify whether they exceed a prescribed threshold, ignores significant evidence of accomplishment in computer science and engineering. For example, conference publication is preferred in the field, and computational artifacts — software, chips, etc. — are a tangible means of conveying ideas and insight (CRA, Best Practices Memo Evaluating Computer Scientists and Engineers For Promotion and Tenure[1]).

The COVID-19 pandemic and the limitations it placed on travel and face-to-face meetings has been enormously disruptive to the entire world, including the computing research community and its many events, which cut to the core of the way we conduct and disseminate our science. Numerous conferences had to be canceled or moved entirely online. After the initial shock, much effort was devoted to trying to reproduce, as much as possible, the scientific environment that was so important to computing research before the pandemic. Many lessons were learned.

As the pandemic proceeds through its phases, we hope that travel and masking restrictions will be lifted. Still, it is likely that the risk of continued outbreaks will prevent a full "return to normalcy" for some number of years. COVID is not a problem that will simply "disappear." At the same time, we have also discovered many effective uses of technology for bringing people together virtually when they cannot meet in person. Sustainability and inclusivity could be

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[1] https://cra.org/resources/best-practice-memos/evaluating-computer-scientists-and-engineers-for-promotion-and-tenure/

greatly enhanced by broadening our old definitions of what it means to convene a group and/or attend a conference.

There are compelling reasons to believe that the future world of conferences in the field of computing research will be hybrid, for at least some time to come. The questions then become, what are the best ways to achieve this future vision and is it only limited to conferences?

Towards that end, the Computing Community Consortium (CCC) held a visioning activity on the technical, social and equity challenges that hybrid environments present. And what better way to experience and experiment than by running the visioning activity in a hybrid environment? Hence, a "Meta Hybrid" Visioning Activity[2] was held October 14-15, 2021 in Washington, DC (10 people), Lowell, MA (3 people), San Jose, CA (2-3 people), and at people's homes or offices throughout the US. Each hub site was independently managed and had different audio-visual capabilities. All three hub sites had a few OhmniLabs telepresence robots for use by remote participants to have cross-site interactions. All participants were required to use the Zoom video-conferencing tool. Audio transcription and chat features were enabled.
Participants who chose to be at a hub site with multiple participants needed to be masked to comply with COVID rules.[3]

The workshop brought together leading researchers and practitioners in various disciplines of computing to discuss the challenges and research opportunities for hybrid environments. The workshop was framed around four themes: sustainability, social factors, technology, and accessibility, which will be expanded upon below. Invited speakers spoke about each of these themes, and breakout sessions were held afterwards to promote further discussion.

Themes

Sustainability

Sustainability has been a significant topic in academia and industry in recent years. The pandemic brought forth additional debate on the sustainability considerations of remote/hybrid work and in particular academic conferences and workshops. The sustainability breakout session considered issues focused on the qualitative and quantitative trade-offs and holistic measurement of diverse metrics that go into factoring in sustainability goals when hybrid events are organized.

The carbon footprint of travel - and particularly air travel has been measured and highlighted for a while and this was discussed in the breakout session as well. It is unclear if focusing primarily on greenhouse gasses is the right approach, and there is a strong need for developing a holistic

[2] https://cra.org/ccc/events/a-meta-hybrid-visioning-workshop/
[3] This caused the interesting phenomenon of some participants at the hub sites spending time away from the other participants or going outside to be able to take off their masks occasionally. Internet access outside was spotty for some people, which caused issues with audio and video quality impacting interactivity. There were also comments from individual attendees who said they would have preferred to see everyone unmasked, which was not possible at the hub sites.

viewpoint in the context of hybrid work. While remote or hybrid meetings reduce travel, the infrastructure needed to support remote video conferencing (network, compute, storage, etc.) and the resulting carbon impact may not be trivial. However, today we often focus solely on the carbon costs without doing an adequate measurement and comparison of trade-offs along multiple dimensions.

One such factor is the inadvertent economic impact on people and local economies that may arise from moving to remote/hybrid work. For instance, not everyone can work productively from home due to their specific situation. Conference centers provide employment and enable local restaurants and stores to thrive. Encouraging remote work may cause people to buy larger homes (perhaps by relocating to affordable locations), which in turn may have an overall detrimental environmental impact.

An idea that surfaced from the breakout discussion was that it may be worthwhile to investigate the options to co-locate conferences to share resources as well as amortize the cost of travel by individuals having longer but fewer trips. Given that many conferences are focused on very specific disciplines, it is unclear if it would be possible to find a set of conferences that would be of interest to a larger audience. Nevertheless, conference co-location has already been happening in the pre-pandemic world and may see increased adoption (e.g., in 2022, USENIX ATC and OSDI are co-located).

Social Factors

A number of interesting points relating to various social factors were brought forward during the workshop discussions. Ultimately, our conferences are social activities and their successes (or failures) depend not only on their scientific content but also on the interactions between participants. Without this, conferences would be indistinguishable from journals.

There was general agreement that the face-to-face interactions we have at live events are fundamentally important to building relationships and advancing the science. Experiences with virtual and then with hybrid meetings brought on by the pandemic appear to allow the maintenance of existing relationships, but are less effective when it comes to establishing new relationships. This suggests an uneven impact on the research community, with early-stage researchers suffering the most from the lack of live interactions. However, the pain will ultimately be felt throughout the entire community as the nurturing of future leaders is also impacted. Organizing hybrid events has been more demanding (some informal estimates suggest the workload is up to 50% more[4]), and “burn out” was voiced as a serious issue for those responsible for running conferences during the pandemic. If there is a lack of “new blood” to step up and take leadership positions, some research areas could suffer significant declines. These downsides could take years or even decades to play out, and they may impact computer

[4] This figure comes from a comment made when a group at the DC hub were standing around in a circle chatting informally. This is the perfect example of why meeting face-to-face has added value. The extra workload on conference organizers was not a topic that we scheduled into the discussion -- it came up spontaneously.

science research in ways that are difficult to measure, but work clearly needs to be done to quantify these negative factors and find ways to ameliorate them.

There was also some discussion of the notable positives to virtual events, or virtual participation at hybrid events. Less travel means lower costs to participate and potentially smaller carbon footprints. This may allow researchers with smaller travel budgets, or with challenging family commitments at home, to be more active in a research community. Virtual participation may work better than having to navigate a physical environment for those with certain kinds of disabilities. These considerations should be balanced with the downsides noted in the previous paragraph. It would be undesirable, for example, if virtual participation led to a form of “second class” citizenship that impacted some demographics more than others. And if some organizations insisted that their employees choose the cheapest possible option for attending a conference – a virtual option (although with a different conference experience) – it could work to sustain the disadvantages felt by researchers who work at less wealthy institutions (there is anecdotal evidence that some universities are in fact taking such positions).

Technology

Much of the discussion regarding technology was about transcription technology. While automated transcription exists, it makes many errors, some amusing, and that is when the conversations are not technical. Technical conversations have a very large number of errors with automatic transcription (or even with manual transcription, if the transcriber is unfamiliar with the technical area), which requires high cognitive load on the part of the reader to fill in the gaps when the transcription fails.

Other concerns arose with how to onboard people, particularly older adults, into new systems. Remote users are much more dependent on their own ability to install and manage whatever a conference provides – and some of those users may have out-of-date software or very old computers. Our systems must be able to work with individual setups of technology, particularly for people with disabilities (e.g., different types of screen readers for people who are blind or have low vision, different access methods for people who are unable to use a keyboard and mouse to control a computer).

A technology we thought could be useful in hybrid meetings was telepresence robots, which each hub had. It was our vision that the remote attendees could connect via the web to the robots, then sit or move around with the in-person participants. The robots were not used much, which we found surprising. Participants may not have used the robots because of a lack of interest in the technology or that they had not had enough time to try the robots before the meetings. It is also possible that it was the structure of our meeting that caused the lack of use; we offered to let people use robots during the breaks, when they might have needed to attend to many other things. Additionally, the in-person meeting space was limited so there was no need to move the robot around to go into different rooms. We did not make plans before the workshop for people to attend remotely via telepresence robot; such planning could have led to increased

usage. As such, the question of how telepresence robots could be well-utilized in hybrid meetings remains open.

Accessibility

Accessibility has always been important. Moving to online systems has not made conferences and meetings more accessible. In fact, the transition has sometimes added new barriers. In the workshop, we started our discussions by trying to clarify how we define accessibility in the context of hybrid settings. We noted that at the beginning of the pandemic people were not prepared for online meetings, and often they did not have the right equipment or software platforms. Everybody was learning and accessibility was often neglected. An observation made in the discussion is that being online takes away the social cues that we often use when interacting with people. We could think of that as a form of disability that applies to everyone.

The lack of the informal social interactions that occur at in person meetings creates difficulties not just for people with disability related access issues. It tends to affect junior people and people from underrepresented groups more than it does with established members of the community. Solutions to substitute for in person social interactions are hard to find. New technologies, like virtual reality or the use of robots to facilitate social interactions, are not yet ready for full use and add to the cost of meetings.

Language can become an accessibility issue. For some people, either non native English speakers or shy people, prerecording videos of talks in advance is helpful, because they can practice and control what they communicate. However, at the same time, recording changes the nature of the interactions and makes even minor mistakes more noticeable because the speaker cannot interact impromptu with the audience and clarify things. Transcription technologies can help but are still limited, in particular when technical terms are used. People who need transcription might end up having more difficulties now than before and, despite the transcription may still need sign interpreters.

We observed that making meetings accessible adds an extra burden to the meeting organizers. The vendors of products are not always clear on how their products are accessible and what types of needs they can handle. People have different needs, what works for some might not work for others. In an in person meeting, conference attendees used to provide impromptu help to people with accessibility problems, but in online meetings someone has to be designated to provide support, and help might not be available for everyone at the right time. The company that provides virtual access can have a big role in taking down barriers to accessibility. After all, online meetings can be more accessible because they do not require travel or the need to find babysitting services for children.

Research Opportunities

The research opportunities outlined below provide opportunities for interdisciplinary research. For example, the development of technology needs to include psychology researchers so that we will create systems that foster better experiences for individuals and the group.

Sustainability

The focus on sustainability research has increased in the last couple of decades but there is yet a lot to be done. The future of work (and life) will be greatly influenced by sustainability considerations, and how we choose to work and live will have great impact on environmental sustainability and the march towards corralling climate change. Towards that end, a multi-disciplinary research agenda for making sustainable decisions is required. In the context of a hybrid world, a holistic approach to measuring and monitoring a variety of sustainability metrics (in addition to just carbon impact) is needed, along with considerations of meeting effectiveness, societal needs and economics. This in turn will enable meeting organizers to consider accurate trade-offs and sometimes in-person or virtual meeting options may prove to be the right choice instead of hybrid meetings.

Social Factors

As indicated by our earlier discussions, there are important social factors at work at our conferences, and we need to find ways to measure the impact of virtual and hybrid events on the health of the research community. This suggests research in the areas of collaboration and cognitive science, which have existing ties to computer science, as well as organizational dynamics which may be more commonly studied in business schools. Some of the effects will be subtle and hard to measure, and the timescales may extend beyond years into decades. It is appealing to believe that there are some aspects of virtual events that can be carried over even when the travel limitations imposed by the pandemic have ended, rather than envisioning the world will move back to the way it was before, but it will take work to identify them.

When it comes to developing tools and practices for the new era of hybrid conferences, it will be important to move beyond the immediate successes technology was able to bring us in the early tumultuous days of COVID (e.g., effective, easy-to-use large-scale video conferencing) and tease out the negatives that need to be addressed, keeping in mind that solutions that work for the most members of a community are not good enough if they systematically disadvantage other members of the community. This is a theme where research, and academic research in particular, plays a special role.

Technology

Much research and development remains for developing effective technologies for hybrid conferences that will enable remote participants to have as effective an experience as people who meet in person. It is not necessarily the case that the remote participants can or will have the same experience as in person participants, but the currently available systems do not work well combining the experiences of these two user groups. There are workarounds, like having everyone sign into Zoom[5], whether in person or remote, but we believe that research could lead to even better experiences leading to the connections that used to develop at in person only events.

Beyond discovering better methods for combining the two types of attendees, there is a need to develop the technology to improve accessibility for people with disabilities and for people with low bandwidth internet. It is difficult to design a web interface, especially for video conferencing, that integrates well on different platforms such as tablets, laptops and phones. Additionally, these current web technologies do not perform well for accessibility.

Participants felt that while licenses for systems like gather.town and Zoom are relatively inexpensive, there is far more cost associated with having to pay people to develop solutions for individual events and to have staff on hand for the events. Participants also noted that most conference organizers are volunteers who are burned out after two years of our new reality.

Finally, there is a need to study how telepresence robots could be utilized to make hybrid meetings more effective. Are there minimum and maximum bounds on the meeting size for the effective use of such technologies? What training is necessary for a person to feel comfortable using the technology? There has been research in small group use of telepresence robots but many research questions remain.

Accessibility

As mentioned earlier, accessibility is not a novel problem, but some aspects of it have been exacerbated by the online or hybrid nature of the interactions among participants in a meeting or conference. In terms of technologies to support accessibility, there are many needs currently unmet. People with visual impairments tend to use their phones because they are familiar with them, but not everything is accessible on the phone. Screen reader programs work, but they are not the best way to access features that are designed for people with normal vision, such as meeting spaces in gathertown or avatars in other software for virtual meetings. Deaf people who are good lip readers are forced to read the transcription or get a sign interpreter. Blind people need to learn how to navigate in virtual spaces, where they miss the information they are used to gathering from the real world with things like a cane or by listening to sounds. Research is needed to create better tools that give choices to users, not just for people with disabilities but for everyone. Improvements in the transcription technology, with better support for technical

[5] Even this “solution” has problems that need to be solved, particularly with audio from multiple computers in the same room. It could be solved by developing the ability to place participants into locations (similar to breakout rooms), where each location would manage the microphones and speakers to only have one input and one output at any given time. Sound source separation could also be utilized. Regardless of the method, there is still development required to improve hybrid events.

terms, will help everyone follow presentations or conversations and enable the automated creation of accurate records of meetings, without the need to take detailed notes. Simpler ways to create visually accessible posters will help blind or low vision people, but everyone else will find them useful. The development of tools to support access will require interdisciplinary work with experts in communication, visualization, and social interactions, as well as people with disabilities, since they will also be users of the technologies.

Conclusions

While we are hopeful that the hardest parts of the COVID-19 pandemic are behind us, we know that hybrid gatherings are a part of the future, and the computing research community (in concert with other communities) has a role to play to ensure that hybrid conferences and meetings can be as good as possible for all involved. We also realize that it is a constantly changing landscape, and this report out is simply a snapshot of opportunities and challenges from October, 2021 - March, 2022 (when this report was released). As such, we will continue to share related resources on our website[6] and welcome community input to these resources here[7] through 2022.

Workshop Participants

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[6] https://cra.org/ccc/events/a-meta-hybrid-visioning
[7] https://computingresearch.wufoo.com/forms/px7b3mg057460v/

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