

How to Accept Remote-Controlled Avatars in the Workplace *

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ABSTRACT

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KEYWORDS

Remote work, satellite work, avatar, physical embodiment

1 Introduction

Due to the Covid-19 outbreak, more people in the workforce have started working from home. Consequently, remote work has become a daily practice in the workplace. As remote work has been accepted as common practice as a part of the future work style after the pandemic, the potential of a new way of working is expanding drastically beyond our initial expectations. Remote work not only reduces travel time and improve a flexible work-life balance, but also eliminates the barriers for people with anxiety and disabilities who previously had limited opportunities to participate in the workplace [1]. Research on remote work after the pandemic has just begun. A shift of implementing a hybrid work model from traditional co-located work, however, is already observed to be a prominent phenomenon even for the limited number of preliminary studies. This shift has accelerated especially among leading digital societies that already have established infrastructure for remote work, such as Denmark [2].

Hybrid work style that provides workers freedom to choose a place to work, is more flexible and inclusive for many reasons. Hybrid work has potential not only to limit some of the disadvantages of remote work [2], but also to increase diversity and inclusion [1] at work contexts. Still, challenges exist. The context of hybrid meetings would be more complexed and satellite participants can easily fall away from the discussion among the co-located participants.

Due to drastic technological progress of remote work tools such as Zoom, Teams, Slack, and Miro [3], and its learning curves among people across nations through intensive mandate

experience, both technologies and skilled knowledge for remote work have been accumulated. This has created a unique global condition of equality of participation - as long as everyone is remote participant. However, in hybrid work, special consideration must be taken because it is extremely challenging to keep up social presence of the satellite participants in hybrid work settings. The more the co-located workers become concentrated and devoted to their work, the lower the social presence of the satellite participants becomes, which undermine remote work participation. Regarding the issues that hinder the participation and collaboration of hybrid participants, only a limited studies have been carried out with no clear solutions.

2. Preliminary Work: What We Found

We are currently conducting a design project on remote work at the Future Living Lab (<https://futurelivinglab.org/>) in a two years research collaboration with telecom company NTT Techno Cross and Tokyo Institute of Technology. Within our topics of inclusion and wellbeing, I am personally interested in the effect of physical *embodiment* [4] in hybrid work as one of the potential solutions to avoid satellite participants being neglected in remote work environments. In this work, we implement remote-controlled avatars as physical embodiments of remote participants and investigate their impact on communication and collaboration in hybrid meetings. We have conducted a few small research projects over the past years.

2.1 Prospects of Hybrid Work

The first study is a literature review conducted in 2020-2021 [2] that focus on advantages and disadvantages of remote work in 2020. The three most common advantages are reduced travel time, work-life balance and flexibility. The disadvantages include mental and physical health challenges and work-relationships. The review suggested that remote work would increase globally even after the pandemic and expected that many organizations were preparing to implement a hybrid work model as their new normal. The hybrid model is promising as it expects to keep the advantages and to limit some of the disadvantages of remote work.

2.2. Potentials of Avatars

Next, we conducted a three-month field experiment in the spring of 2022. It investigated the effects of avatars on perceived social presence and co-presence in business meetings between managers

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and their co-workers [5]. We studied the effects of using digital avatar robots in virtual meeting environments, specifically, focusing on the perception of social presence and co-presence between workers and their managers. Our experimental results indicated that a significant number of participants felt an improvement in social presence, co-presence and overall virtual meeting experience when using digital avatars in their meetings. The impact was greater for those who had an introductory first meeting or had a meeting with persons from the higher corporate hierarchy. Our study suggested that remote work through digital avatars easily can be accepted and increase social presence. In particular, the embodiment of the participants by the avatar seems to facilitate collaboration due to its physicality and presence.

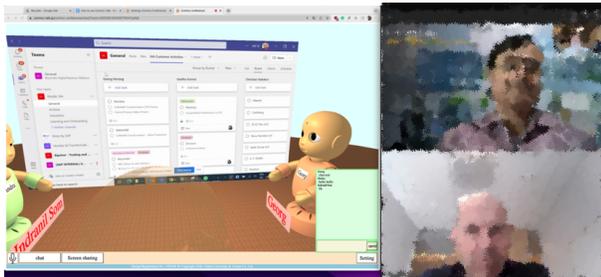


Figure 1: Collaboration through Digital Avatar

2.3 Avatars in Hybrid Workshops

Most recently, we have conducted a series of experiments on influence and acceptance of avatars in a hybrid work context as a part of Future Living lab. We carried out four hybrid design workshops during January to August 2022, where one member joined as a satellite participant. The satellite participant controlled a remote avatar, Avatar Bear, with physical embodiment at a co-located stage as shown in Fig. 2. The Avatar Bear was deployed with an AI function based on the Wizard of Oz technique [6] mediated a by human operator. In the four workshops, the first session used an ordinary online meeting tool, Zoom, with a tablet screen. The remaining three sessions used the Avatar Bear. One satellite participant operated Zoom and the Avatar Bear in distance. Among the three Avatar Bear sessions, the condition of the last session was slightly different from the two other sessions, which limited the Avatar Bear's action. The Avatar Bear in the fourth session could act only when the satellite participant commanded explicitly: waving hands, nodding, shaking the body while in the second and third sessions AI of Avatar Bear sometimes made autonomous decisions such as waving hands and nodding.

Our preliminary analysis of the field experiments indicated that the Avatar Bear due to its physical embodiment can increase the satellite participant's social presence. Despite the participants distance, the satellite participant was highly likely to be listened to and accepted by the 5-6 co-located participants and overall satisfaction among all participants was high. There were a few occasions where the co-located participants hardly showed clear acceptance to the satellite participant presence, however interestingly, the subjective satisfaction level of the satellite

participant was significantly higher than the previous remote participation with Zoom, a typical virtual meeting tool.



Figure 2: Avatar Bear in Wizard of Oz method

The satellite participant was often unable to provide timely response due to network delays, and occasional troubles in understanding the situation. Thus, in the second and third workshops, the avatar operator occasionally acted independently and autonomously, assuming the feelings of the satellite participant. To our surprise, the avatar in the second and third workshops was accepted better by all the participants than at the last workshop when the avatar acted entirely only by the satellite participant's commands.

3. Discussion and Implications

Hybrid work is becoming an easier and convenient choice after Covid-19, but we are also witnessing that the satellite side of remote work is unconsciously and unintentionally neglected and eliminated in meeting discussions, which could easily become a negative experience for satellite workers.

Our preliminary experiments and investigations have hinted to several effects of avatars with physical embodiment on participating at remote work. Some of the most prominent preliminary findings are: 1) group dynamics towards human relations in the workplace; 2) actions of active inclusion of the satellite participant; and 3) subjective satisfaction among both co-located and satellite participants. Based on these preliminary results, we are currently exploring potential research directions in our research question; *how can the satellite participants in hybrid work avoid being neglected with the help of physical embodiment?*

One is to improve the quality of physical presence of avatars to provide the best hybrid work experience. In our experiment, we observed prompt collaboration between the remote operator as the satellite participant and the Avatar Bear as AI mediated by the human operator. The remote operator and the Avatar Bear acted as one as if the Avatar was possessed by a human [7]. This collaboration amplified the satellite participant's capabilities and overall quality of the satellite participant's presence in hybrid work. As exemplified in the experiment, we are interested in improving quality of interaction between satellite and co-located participants

through establishing satellite participants and avatar collaboration. Currently, quite a few remote-controlled avatars are starting to play active roles in our society, with limited usage. In near future, avatars can support remote operators by providing decision support based on the on-site judgment, which generate a possibility of man-machine collaboration with extended human capabilities. This can result in better acceptance and higher satisfaction.

Another possible direction is to increase and improve the subjective satisfaction of collaborative work in hybrid environment as one of the indirect approaches to our challenge. In contrast to co-located work and remote work, in hybrid work, the satellite participants tend to be less satisfied because they are less accepted by the co-located workers. Even though this approach does not change the fact that satellite participants can easily fall away from the discussion, I see a potential to achieve better remote work environment. Thus, I would like to work on this a challenge as to improve the satisfaction of not only one side of participants, but also both remote and co-located participants in hybrid work.

It is expected that the hybrid work will increase in our society. In such context, I imagine the role of the avatar's physical embodiment as a substitute of physical self, will increase drastically due to its physicality and presence. Considering the high potential of deploying avatars as physical embodiments in hybrid work environment, how can remote-controlled avatars support hybrid work and improve the overall work environment? How can avatar assistance increase worker satisfaction and wellbeing in hybrid work? I would like to contribute designing better remote work environments from such avatar human collaboration perspectives.

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