Sharing Timing in Physical and Virtual Spaces

*Julien Laroche[1], Julia Ayache[1], Marco Coraggio[2], Angelo di Porzio[2], Francesco de Lellis[3], Anna Katharina Hebborn[4], Andreas Panayiotou[5], Lyam Pepin[6], Panayiotis Charalambous[5], Simon Pla[1], Pierre Jean[1], Mario di Bernardo[2,3], Didier Stricker[4], Benoît Bardy[1]

1. EuroMov DHM, Univ. Montpellier, IMT Alès, 2. Scuola Superiore Meridionale, 3. Univ. Napoli " Federico II" , 4. German Research Center for Artificial Intelligence, 5. CYENS, 6. Univ. Paul Valery Montpellier,

Communicating and connecting with others relies on fine-tuned embodied coordination. Yet, as our social lives increasingly shift online where movement cues become impoverished, our ability to connect meaningfully is getting challenged. While Virtual Reality (VR) offers promising opportunities for embodied interaction in digital spaces, little is known about how to best capture, render and foster embodied coordination in this medium. Hence the ShareSpace project aims to better understand the constraints of virtual spaces on multi-agent embodied coordination, with the goal to optimize both motion capture and rendering.We report a series of studies on group movement coordination performed in both physical and virtual reality. In the first two studies, triads and quartets synchronized arm movements and reported their experiences of social connection. Results show that the kinematic and social benefits of group synchrony observed in physical reality transfer to VR. However, while people accelerated their pace when synchronizing in physical settings, this tendency was reversed in VR, showing how digital constraints can alter coordination strategies. In a subsequent VR study, we restricted participants' field of view to examine their interaction strategies, and in some cases, replaced one human partner with an adaptive artificial agent. This agent shared a similar appearance but was driven by a cognitive architecture optimized for group coordination. The presence of the adaptive agent led to an increase in movement pacing, suggesting that it could counteract the decelerating effects of digital interaction on collective kinematics. Most participants did not detect the agent swap yet reported feeling less socially connected to partners who had been replaced. These findings show the critical role of subtle kinematic cues in social coordination and offer new guidelines to design hybrid digital spaces that support authentic group interaction.

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