Understanding XR-Supported Creative Collaboration through a Domain-Specific Lens

Haeri Kim
Dept. of Industrial Design, KAIST
kimhaeri@kaist.ac.kr

Anam Ahmad Khan
Korea Advanced Institute of Science and Technology
anam.khan@kaist.ac.kr

Andrea Bianchi
Dept. of Industrial Design, KAIST
andrea@kaist.ac.kr

Abstract
Creative fields such as music, theatre, and dance face unique challenges in remote and hybrid work because they rely heavily on in-person interaction. Extended reality (XR) technologies promise to support collaboration at a distance, but existing studies are scattered across domains and systems. This paper reports a review of 16 XR/VR/MR/AR systems for collaborative creative production, focusing on performers and creators rather than audiences. Grounded in HCI, we analyse how sensory modalities, spatial–temporal organisation, and participant structures shape collaboration across music, theatre, dance, and performance. Our synthesis identifies three cross-cutting themes: (1) multimodality is domain-specific rather than generic, (2) temporal requirements call for distinct modes of collaboration beyond always-live performance, and (3) participant structures determine how sensory and control resources are allocated across roles. We argue that XR systems better support creative collaboration when modalities, time, space, and control are explicitly tuned to domain practices and role structures.

Keyword
Extended Reality, Collaborative creative production, Multimodal interaction, Participant structure

1. Introduction
Remote and hybrid work pose distinctive challenges for creative disciplines like music, theatre, and dance, which depend on in-person, physical engagement. Extended reality (XR) technologies—virtual reality (VR), augmented reality (AR), and mixed reality (MR)—offer promising solutions by replicating embodied, co-present collaboration at a distance. Prior work shows that immersive virtual environments enhance creativity by supporting idea exploration and flexible perspective-taking [1], and that VR and AR are emerging as key communication tools for creative professionals [2].

Existing systematic reviews have covered collaborative mixed reality [3], design prototyping [4], virtual reality in music concerts [5], and collaborative learning in immersive VR [6] separately. However, domain-specific studies have not been synthesised to provide a cross-domain understanding of how XR supports remote collaborative creative production.

This review takes a creator-focused perspective—performers, producers, and creators—rather than audiences, emphasising process-oriented aspects like planning, rehearsal, and ideation. We address three research questions: (RQ1) Which sensory modalities are most effective across different creative domains? (RQ2) How do spatial and temporal requirements vary across domains? (RQ3) How does participant structure relate to sensory channel distribution? Our analysis reveals three findings: multimodality is domain-specific, temporal requirements demand distinct collaboration modes, and participant structures shape the distribution of sensory and control resources. This review identifies design patterns and domain-specific insights for developing better XR systems for remote creative collaboration.

2. Related Work
Remote creative collaboration disrupts traditional workflows by eliminating rehearsal spaces, shared equipment, and informal coordination. In music, this impacts real-time ensemble performances [7, 8], while other fields experience multitasking overload and communication issues [9, 10]. Creative virtual environments (CVEs) mitigate these problems by offering immersive spaces that facilitate idea exploration and sustained engagement [1, 11], with avatar cues improving both creative output and group cohesion [11]. Previous research shows CVE participants reflect and redirect ideas through gaze, gesture, and spatial positioning [12-16], which depends on accurate avatar movements and low-latency communication [17, 18]. Spatial arrangements and avatar designs can indicate roles—technicians near control panels, performers on virtual stages—fostering cross-role awareness [19-22]. Yet, existing studies focus on single domains, lacking a comprehensive understanding of how sensory channels, timing, and participant roles interact to influence XR collaboration.

3. Methods

3.1 Search Strategy

We systematically searched the ACM Digital Library, targeting three dimensions: (1) collaborative and multi-user interaction, (2) immersive technologies, and (3) creative performance domains. Our query included terms from the abstract, title, and keyword fields as shown in Figure 1. After completing the search, we proceeded to the screening phase.

("collaborat*" OR "synchroni*" OR "team*" OR "multi-user" OR "multiplayer" OR "social") AND ("xr" OR "vr" OR "mr" OR "ar" OR "extended reality" OR "virtual reality" OR "mixed reality" OR "augmented reality" OR "immersive") AND ("music*" OR "concert*" OR "opera" OR "stage production" OR "production" OR "theatre" OR "theater" OR "performance" OR "rehearsal" OR "choreograph*")

Figure 1 Search Keywords

3.2 Screening

Our ACM DL keyword search yielded 775 records. We focused on major venues in XR and HCI (e.g., CHI, CSCW, UIST, VRST, IEEE VR, IMWUT, ISMAR, and C&C), selected based on Google Scholar HCI rankings and domain relevance. For venues not comprehensively indexed in ACM DL (e.g., ISMAR), candidate papers were additionally identified via targeted proceedings browsing and screened using the same criteria. Restricting the dataset to full papers and journal articles reduced the pool to 66. We then screened titles and abstracts using the criteria in Table 1, followed by full-text review of potentially relevant papers. This process resulted in 16 papers for final analysis.

Table 1. Inclusion and Exclusion Criteria

Criterion	Description
IC1	Reports collaborative creative work in XR/VR/MR/AR (e.g., production, rehearsal, ideation, creation)
IC2	Involves two or more participants collaborating co-located or remote, regardless of whether the formal roles are clearly differentiated.
IC3	Human-centered study (user experience, collaboration effects, design patterns)
IC4	Situated in creative domains such as music, theatre, performance, dance, and design.
EC1	Not a full paper or journal article(e.g., poster, demo, adjunct, WIP, extended abstract)
EC2	Pure infrastructure or tool papers with no collaboration analysis
EC3	Single-user studies
EC4	Non-English or inaccessible

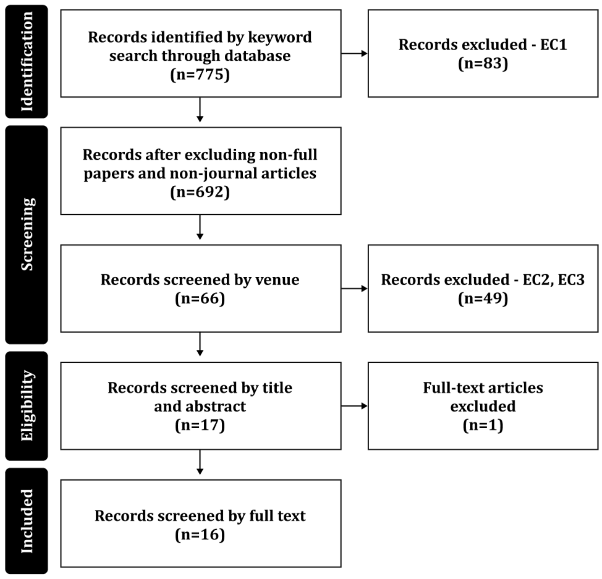

Figure 2 PRISMA Flow Diagram

4. Results

As shown in Table 2, we organized the 16 selected papers into four domains: 3 on Music, 7 on Theatre/Performance, 3 on Dance/Movement, and 3 on General Collaborative Creativity. With these domains established, we examined how sensory modalities and interaction design are tailored in each, setting the stage for our analysis.

Table 2. Paper distribution by Domain

Domain	Count	Papers
Music	3	[23], [24], [25]
Theatre/ Performance	7	[26], [27], [28], [32], [33], [34], [36]
Dance/ Movement	3	[29], [30], [31]
General Collaborative Creativity	3	[1], [11], [35]

4.1 RQ1: Which sensory modalities are most effective across different creative domains?

Across domains, XR systems allocate sensory channels in ways that mirror core creative practices (Figure 3). For example, in music, collaboration depends on high-quality, low-latency audio, with simple visual indicators of sound patterns and performer positions, and occasional physiological sensing to support timing and shared expression [23-25]. In theatre, by contrast, systems more evenly combine voice, visual staging, and body or hand tracking, using spatial mapping to support navigation and blocking on virtual stages [26-28].

Meanwhile, in dance, most systems rely on visual access to whole-body movement rather than extensive sensing, with only one system using explicit body tracking to support synchronization [29-31]. Taken together, these patterns suggest that effective multimodality is domain-specific. Specifically, music systems privilege audio, theatre systems balance voice and spatial staging, and dance systems emphasize visual observation of movement, so designers should align modalities with domain needs rather than simply maximizing their number.

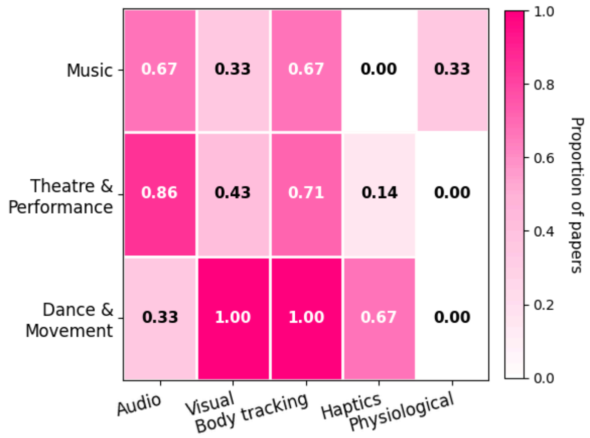

Figure 3 Sensory Inputs by Domain

4.2 RQ2: How do spatial and temporal requirements of creative workflows vary across domains?

Figure 4 summarises how the reviewed systems are positioned along spatial (co-located–distributed) and temporal (asynchronous–synchronous) axes by domain.

Co-located vs. Distributed

In music, effective remote collaboration relies on minimizing sound delay and maintaining enough visual co-presence for real-time ensemble playing across distance [23, 25]. In theatre, actors working in different locations need clear spatial markers and staging boundaries because virtual spaces limit peripheral vision [26]; XR theatre studies also describe hybrid constellations in which rehearsals or direction occur in VR while performers share a physical stage [28], or remote audiences connect to a shared venue [32]. In dance, social VR can support distributed "vibing together", but movement synchronization and embodied co-presence are highly sensitive to tracking quality, delay, and the fidelity of avatar representation [29, 30].

Synchronous vs. Asynchronous

In music, ensemble performance is fundamentally synchronous: musicians depend on real-time timing, gesture, and mutual awareness, so XR music systems prioritize low-latency audio and shared visual cues to extend live playing across distance [23, 24, 25]. In contrast, theatre features more flexible temporal structures across its production phases: while live performances demand tight synchronous coordination among performers, directors, and technical operators, rehearsal, recording review, and technical adjustment work can sometimes be organized more asynchronously [32, 33]. Similarly, in dance, studies emphasize synchronous shared movement in social VR, where "vibing together" and feelings of co-presence are highly sensitive to tracking quality, delay, and the fidelity of embodied representation [29, 30].

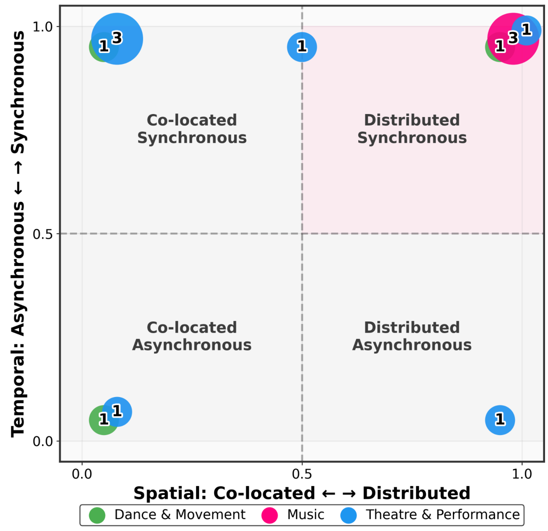

Figure 4 Spatial-temporal Distribution by Domain

4.3 RQ3: How does participant structure relate to the choice of sensory inputs in XR/VR/MR/AR collaboration?

Building on previous findings, we grouped participants into three patterns: peer-to-peer, ensemble, and hierarchical (Table 3).

Table 3. Participant Structure

Structure	Group size	Role	Papers
Peer-to-peer	Small	Equal	[23], [25], [29], [35]
Ensemble	Medium-Large casts	Mostly equal	[26], [36]
Hierarchical	Variable	Differentiated	[32], [33], [34]

Peer-to-peer setups employ symmetric sensory channels: music duos coordinate through shared virtual instruments and mixed-reality views [23, 25], while social VR dance and LeMo offer equal body tracking, avatars, and spatial audio [29, 35]. Ensembles grow by decreasing embodiment fidelity. VR theatre utilizes social VR and video tools focused on voice and basic visuals rather than full-body tracking [26, 32]; audience interaction is limited to simple actions, whereas performers have more comprehensive controls [32, 36]. Hierarchical arrangements designate role-specific channels: directors and technicians use overview interfaces such as desktop views, cue systems, and virtual cameras [32, 33], while performers rely on embodied voice and movement via avatars [26]. Sensory inputs are organized by role.

5. Discussion

This review analyzed how XR/VR/MR/AR systems support creative work in music, theatre, and dance. In RQ1–RQ3, we found that these systems already encode domain practices and roles, but they do so implicitly rather than through explicit, generalizable design choices.

5.1 Domain-sensitive multimodality

Our review shows that multimodality in creative XR work depends on the domain: music systems prioritize low-latency audio [23-25], theatre systems emphasize spatial staging and voice [26-28], and dance systems focus on visually perceived whole-body movement [29-31], with other channels supporting. We propose domain-sensitive multimodality: designers should first stabilize the primary modality for the domain, then add supporting channels only as needed to clarify action, aid reflection, or reduce perceived distance. This approach complements multimodal VR and tangible interaction strategies that use rich multi-channel environments to boost presence and expressivity [37, 38], but shifts the focus from additional channels to fine-tuned modality bundles tailored to domain practice.

5.2 Time and modes of collaboration

We find that temporal needs shape distinct collaboration modes: XR music systems support synchronous, latency-sensitive ensemble performance [23-25], while theatre [26, 32, 33] and some dance systems [29, 30] combine live shows with asynchronous phases like rehearsal, recording review, and technical adjustments. To address workflow mismatches with systems that assume a single continuous “live mode,” we propose XR tools explicitly offer different collaboration modes—such as feedback-focused interfaces for live performance and timeline- or annotation-based interfaces for rehearsal and review. Unlike prior work that treats latency, synchrony, and spatial distribution mainly as network or quality-of-service parameters in telepresence [39], networked music performance [40], and collaborative VR [41, 42], we present them as features to be designed in domain-specific creative workflows.

5.3 Participant structure and sensory allocation

Participant structure systematically determines how sensory and control resources are allocated: peer-to-peer setups use symmetric channels [23, 25, 29, 35], ensembles trade embodiment detail for scalability [26, 32, 36], and hierarchical configurations divide overview controls for directors and technicians, embodied input for performers, and minimal input for spectators [32, 33]. We respond by advocating role-sensitive interface design, where sensory and control resources are planned per role and rehearsals enable safe role-switching. This expands on research in audience participation [43] and computer-supported cooperative work (CSCW) [44], which often assume equal access or focus on a single primary user, by demonstrating how innovative XR systems can encode and reorganize role structures through sensory and control distribution.

6. Conclusion

This review examined 16 studies on XR systems utilized in collaborative creative projects spanning music, theatre, and dance. The results reveal domain-specific constraints: exact timing in music, spatial staging rhythms in theatre, and kinesthetic engagement in dance. Furthermore, different participation styles—ranging from peer-to-peer to hierarchical—shape how users perceive, listen to, and control XR experiences. While standard collaboration tools are often insufficient for creative work, XR systems should be customized to fit the unique practices and roles of each domain, with sensory and control features assigned accordingly. Building on these insights, we recommend that future research develop and empirically test design guidelines tailored to each creative domain, and investigate collaboration in underrepresented contexts and participation models in XR.

Acknowledgement

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT)(RS-2024-00337803).

Reference

1. Bourgeois-Bougrine, S., Bonnardel, N., Burkhardt, J.-M., Thornhill-Miller, B., Pahlavan, F., Buisine, S., Guegan, J., Pichot, N. and Lubart, T. Immersive Virtual Environments' Impact on Individual and Collective Creativity: A Review of Recent Research. European Psychologist. 27(3). Hogrefe. pp. 237-253. 2022.

2. Ajiva, O. A., Ejike, O. G. and Abhulimen, A. O. Advances in Communication Tools and Techniques for Enhancing Collaboration among Creative Professionals. International Journal of Frontiers in Science and Technology Research. 7(1). pp. 66-75. 2024.

3. de Belen, R. A. J., Nguyen, H., Filonik, D., Del Favero, D. and Bednarz, T. A Systematic Review of the Current State of Collaborative Mixed Reality Technologies: 2013-2018. AIMS Electronics and Electrical Engineering. 3(2). pp. 181-223. 2019.

4. Kent, L., Snider, C. and Gopsill, J. A. Mixed Reality in Design Prototyping: A Systematic Review. Design Studies. 77. Elsevier. 101046. 2021.

5. Park, J., Choi, Y. and Lee, K. M. Research Trends in Virtual Reality Music Concert Technology: A Systematic Literature Review. IEEE Transactions on Visualization and Computer Graphics. 30(5). IEEE. pp. 2195-2205. 2024.

6. Paulsen, L., Dau, S. and Davidsen, J. G. Designing for collaborative learning in immersive virtual reality: a systematic literature review. Virtual Reality. 28(1). Springer. Article 63. 2024.

7. Cai, C. J. and Terry, M. On the Making and Breaking of Social Music Improvisation during the COVID-19 Pandemic. NFW '20 Symposium on the New Future of Work. Microsoft Research. 2020.

8. Cai, C. J., Carney, M., Zada, N. and Terry, M. Breakdowns and Breakthroughs: Observing Musicians' Responses to the COVID-19 Pandemic. Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (CHI '21). New York, NY: ACM. Article 571, pp. 1-13. 2021.

9. Mortezaee, F. and Sinclair, B. R. Design Efficacy at a Distance: Collaboration between Remote Design Teams. 3rd Valencia International Biennial of Research in Architecture. Valencia: Universitat Politècnica de València. 2022.

10. Hassan, A. F., Karim, A. M. and Hameed, J. Hybrid Model for Remote Work Practice in the Post Pandemic Era: Prospects and Challenges. International Journal of Academic Research in Business. 12(12). pp. 1920-1926. 2022.

11. Guegan, J., Buisine, S., Mantelet, F., Maranzana, N. and Segonds, F. Avatar-Mediated Creativity: When Embodying Inventors Makes Engineers More Creative. Computers in Human Behavior. 61. Elsevier. pp. 165-175. 2016.

12. Ruddle, R. A., Payne, S. J. and Jones, D. M. Navigating Large-Scale Virtual Environments: What Differences Occur Between Helmet-Mounted and Desktop Displays? Presence: Teleoperators and Virtual Environments. 8(2). MIT Press. pp. 157-168. 1999.

13. Steptoe, W., Wolff, R., Murgia, A., Guimaraes, E., Rae, J., Sharkey, P., Roberts, D. and Steed, A. Eye-Tracking for Avatar Eye-Gaze and Interactional Analysis in Immersive Collaborative Virtual Environments. Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work (CSCW '08). New York, NY: ACM. pp. 197-200. 2008.

14. Schroeder, R. Social Interaction in Virtual Environments: Key Issues, Common Themes, and a Framework for Research. In Schroeder, R. (Ed.) The Social Life of Avatars: Presence and Interaction in Shared Virtual Environments. London: Springer. pp. 1-18. 2002.

15. Bai, H., Sasikumar, P., Yang, J. and Billinghurst, M. A User Study on Mixed Reality Remote Collaboration with Eye Gaze and Hand Gesture Sharing. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20). New York, NY: ACM. pp. 1-13. 2020.

16. Tromp, J. G., Steed, A. and Wilson, J. R. Systematic Usability Evaluation and Design Issues for Collaborative Virtual Environments. Presence: Teleoperators and Virtual Environments. 12(3). MIT Press. pp. 241-267. 2003.

17. Pan, Y. and Steed, A. Avatar Type Affects Performance of Cognitive Tasks in Virtual Reality. Proceedings of the 25th ACM Symposium on Virtual Reality Software and Technology (VRST '19). New York, NY: ACM. Article 6, pp. 1-4. 2019.

18. Steptoe, W., Steed, A., Rovira, A. and Rae, J. Lie Tracking: Social Presence, Truth and Deception in Avatar-Mediated Telecommunication. Proceedings of the 28th ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '10). New York, NY: ACM. pp. 1039-1048. 2010.

19. Näykki, P., Pyykkönen, S., Latva-aho, J., Nousiainen, T., Ahlström, E. and Toivanen, T. Pre-service teachers' collaborative learning and role-based drama activity in a virtual reality environment. Journal of Computer Assisted Learning. 40(6). Wiley. pp. 3264-3277. 2024.

20. Yoon, B., Kim, H.-I., Lee, G. A., Billinghurst, M. and Woo, W. The Effect of Avatar Appearance on Social Presence in an Augmented Reality Remote Collaboration. Proceedings of the 2019 IEEE Conference on Virtual Reality and 3D User Interfaces (VR). IEEE. pp. 547-556. 2019.

21. Greenhalgh, C. and Benford, S. Massively Multi-User Virtual Reality Systems: The DIVE System. Proceedings of the 5th IEEE Virtual Reality Annual International Symposium. IEEE Computer Society. pp. 19-26. 1997.

22. Bystrom, K.-E., Barfield, W. and Hendrix, C. Conceptual Model of the Sense of Presence in Virtual Environments. Presence: Teleoperators and Virtual Environments. 8(2). MIT Press. pp. 241-244. 1999.

23. Jung, B., Hwang, J., Lee, S., Kim, G. J. and Kim, H. Incorporating Co-presence in Distributed Virtual Music Environment. Proceedings of the ACM Symposium on Virtual Reality Software and Technology (VRST '00). New York, NY: ACM. pp. 206-212. 2000.

24. Wang, Y., Xi, M., Adcock, M. and Martin, C. P. Seeing the Sound: Supporting Musical Collaboration with Augmented Reality. Proceedings of the 2025 Conference on Creativity and Cognition (C&C '25). New York, NY: ACM. pp. 99-112. 2025.

25. Schlagowski, R., Can, Y. S., Gupta, K., Mertes, S., Billinghurst, M. and André, E. Wish You Were Here: Mental and Physiological Effects of Remote Music Collaboration in Mixed Reality. Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23). New York, NY: ACM. pp. 1-16. 2023.

26. Branch, B., Efstratiou, C., Mirowski, P., Mathewson, K. W. and Allain, P. Tele-Immersive Improv: Effects of Immersive Visualisations on Rehearsing and Performing Theatre Online. Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (CHI '21). New York, NY: ACM. Article 458, pp. 1-13. 2021.

27. Cheok, A. D., Wang, W., Yang, X., Prince, S., Wan, F. S., Billinghurst, M. and Kato, H. Interactive Theatre Experience in Embodied + Wearable Mixed Reality Space. Proceedings of the 1st IEEE and ACM International Symposium on Mixed and Augmented Reality (ISMAR '02). Darmstadt, Germany: IEEE. pp. 59-68. 2002.

28. Pope, V., Dawes, R., Schweiger, F. and Sheikh, A. The Geometry of Storytelling: Theatrical Use of Space for 360-Degree Videos and Virtual Reality. Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17). New York, NY: ACM. pp. 4468-4478. 2017.

29. Piitulainen, R., Hämäläinen, P. and Mekler, E. D. Vibing Together: Dance Experiences in Social Virtual Reality. Proceedings of the CHI Conference on Human Factors in Computing Systems (CHI '22). New York, NY: ACM. Article 188, pp. 1-18. 2022.

30. Lottridge, D. M., Weber, R., Cook, J. and Davies, R. C. Centering Bodies in Space and Place through Virtual Reality Dance Performance: A Practice-Based Research Perspective. Proceedings of the 2024 Conference on Creativity and Cognition (C&C '24). New York, NY: ACM. pp. 185-195. 2024.

31. Hu, Y.-H., Hatada, Y. and Narumi, T. Beyond Mirrors: Exploring Behavioral Changes through Comparative Avatar Design in VR Taiko Drumming. Proceedings of the 2023 ACM Symposium on Virtual Reality Software and Technology (VRST '23). New York, NY: ACM. Article 31, pp. 1-11. 2023.

32. Wales, M., Wheeler, M., Cimolino, G., Levin, L., Mees, J. and Graham, T. C. N. Process, Roles, Tools, and Team: Understanding the Emerging Medium of Virtual Reality Theatre. Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems (CHI '24). New York, NY: ACM. Article 1207, pp. 1-24. 2024.

33. Nebeling, M., Wu, L. and Maddali, H. T. XCam: Mixed-Initiative Virtual Cinematography for Live Production of Virtual Reality Experiences. Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25). New York, NY: ACM. Article 192, pp. 1-16. 2025.

34. Uro, P., Berthaut, F., Pietrzak, T., Wanderley, M. M. and Grisoni, L. Strategies for the Reconciliation of Artistic Intent and Technical Constraints in Mixed Reality Performances. Proceedings of the 2025 ACM Designing Interactive Systems Conference (DIS '25). Funchal, Madeira Island, Portugal: ACM. Article 181, pp. 1-23. 2025.

35. Men, L. and Bryan-Kinns, N. LeMo: Exploring Virtual Space for Collaborative Creativity. Proceedings of the 2019 ACM Conference on Creativity and Cognition (C&C '19). New York, NY: ACM. pp. 71-82. 2019.

36. Ahn, S. C., Kim, I.-J., Kim, H.-G., Kwon, Y.-M. and Ko, H. Audience Interaction for Virtual Reality Theater and Its Implementation. Proceedings of the ACM Symposium on Virtual Reality Software and Technology (VRST '01). New York, NY: ACM. pp. 41-45. 2001.

37. Steuer, J. Defining Virtual Reality: Dimensions Determining Telepresence. Journal of Communication. 42(4). Oxford University Press. pp. 73-93. 1992.

38. Ishii, H. and Ullmer, B. Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms. Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '97). New York, NY: ACM. pp. 234-241. 1997.

39. Rottondi, C., Chafe, C., Allocchio, C. and Sarti, A. An Overview on Networked Music Performance Technologies. IEEE Access. 4. IEEE. pp. 8823-8843. 2016.

40. Casas, J. R., Cobo, C. and Guerrero, R. Distributed Architectures for Collaborative Environments. Multimedia Tools and Applications. 64(2). Springer. pp. 429-452. 2013.

41. Khalid, H., Hussain, M. and Shuaib, U. A Survey on Latency Issues in Collaborative Virtual Environments. Journal of Network and Computer Applications. 66. Elsevier. pp. 1-23. 2016.

42. Van Damme, K., All, A. and De Marez, L. A Review of Virtual Reality Collaboration Platforms. Virtual Reality. 28(1). Springer. pp. 1-22. 2024.

43. Hödl, O., Kayali, F. and Fitzpatrick, G. Designing Interactive Audience Participation Using Mobile Phones in a Musical Performance. Multimedia Systems. 18(4). Springer. pp. 311-325. 2012.

44. Stewart, J., Bederson, B. B. and Druin, A. Single Display Groupware: A Model for Co-present Collaboration. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '99). New York, NY: ACM. pp. 286-293. 1999.