

Taehei Kim

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Research Statment

My research question is how can we generate and synthesize a collaborative XR space that allows multiple people to share and traverse residing spaces as if they are living together, although physically far away? To address this question, I have been adopting both mathematical and human interaction methods in XR telepresence system development. At the level of space generation and optimization, my research calculates optimal layouts or synthesizes partial spaces depending on the purpose of the collaboration space. At the level of user experience, my research allows users to transmit their physical movement and surrounding environment to others so that all participants can observe parts of each other's space and current activity. Furthermore, these transmitted partial spaces are augmented within each remote user's local space, which then allows remote users to walk into, and pan across. Looking forward, I see generative AI and impossible space designs as new possibilities. Large language models and diffusion-based spatial synthesis open new possibilities for intent-driven environment generation.

Education

Ph.D Candidate, Culture Technology 2021–2026 (ABD)

Korea Advanced Institute of Science & Technology (KAIST), Daejeon, South Korea

Advisor: Prof. Sung-Hee Lee

Dissertation: User Intent Driven Dynamic Space Optimization and Adjoin for Mixed Reality Telepresence

M.S., Culture Technology 2018–2021

Korea Advanced Institute of Science & Technology (KAIST), Daejeon, South Korea

Advisor: Prof. Sung-Hee Lee

Thesis: Quadruped Locomotion on Non-Rigid Terrain using Reinforcement Learning

B.A., Asian Studies and Computer Science 2013–2018

Yonsei University, Seoul, South Korea

Publications

Journal Articles

1. **T. Kim**, J. Shin, H. Kim, H. Jang, J. Kang, and S.-H. Lee. "Voronoi rooms: Dynamic visibility modulation of overlapping spaces for telepresence." *ACM Transactions on Graphics (TOG)*, vol. 45, no. 2, 2025. DOI: 10.1145/3777900. (To appear Apr 2026)
2. J. Kang, **T. Kim**, H. Kim, and S.-H. Lee. "Real-time translation of upper-body gestures to virtual avatars in dissimilar telepresence environments." *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, vol. 31, no. 10, pp. 8711–8725, 2025. DOI: 10.1109/TVCG.2025.3577156.
3. **T. Kim**, H. Kim, J. Lee, and S.-H. Lee. "Evaluating user perception toward physics-adapted avatar in remote heterogeneous spaces." *Computers & Graphics*, vol. 128, p. 104185, 2025.
4. D. Yang, J. Kang, **T. Kim**, and S.-H. Lee. "Visual guidance for user placement in avatar-mediated telepresence between dissimilar spaces." *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, vol. 30, no. 12, pp. 7558–7570, 2024.

Conference Papers

5. J. Shin, H. Kim, E. Lee, D. Shin, K. Lee, **T. Kim**, H. Kim, J. An, and S.-H. Lee. "Situated embodied XR agents via spatial reasoning and prompting." *IEEE ISMAR Adjunct*, pp. 933–934, 2025. DOI: 10.1109/ISMAR-Adjunct68609.2025.00255.
6. **T. Kim**, J. Shin, H. Kim, H. Jang, J. Kang, and S.-H. Lee. "Visibility modulation of aligned spaces for multi-user telepresence." *IEEE ISMAR Adjunct*, pp. 626–627, 2024. **Best Demo Honorable**

Mention.

7. J. Kang, D. Yang, **T. Kim**, Y. Lee, and S.-H. Lee. “Real-time retargeting of deictic motion to virtual avatars for augmented reality telepresence.” *IEEE ISMAR*, pp. 885–893, 2023.
8. H. Jang*, **T. Kim***, S. Oh, J. Lee, S. Lee, and S. H. Yoon. “Sense of embodiment inducement for people with reduced lower-body mobility and sensations with partial-visuomotor stimulation.” *ACM SIGGRAPH Emerging Technologies*, pp. 1–2, 2022. (*Equal contribution)
9. H.-I. Kim, **T. Kim**, E. Song, S. Y. Oh, D. Kim, and W. Woo. “Multi-scale mixed reality collaboration for digital twin.” *IEEE ISMAR Adjunct*, pp. 435–436, 2021.

Preprints

10. **T. Kim** and S.-H. Lee. “Quadruped locomotion on non-rigid terrain using reinforcement learning.” *arXiv:2107.02955*, 2021.

Under Review: Two paper currently under review.

Professional Experience

Co-Founder, BerryHi 2024–Present

Developing MR telepresence systems; product on Meta Quest Store: Parameter Room

Funding: KEP Startup Fund, \$37,000 USD [Real-Space Overlay Scene Generation for VR Crowdsourcing Data Collection] (2026)

Funding: Daejeon Art Center Joint New Technology Performance, \$11,000 USD (2024)

Metaverse Instructor 2021–2023

Clients: Dangjin Cultural Foundation, Daejeon Culture and Arts Foundation, Hanwha Galleria, 3PROTV

Designed and deployed metaverse experiences for public/private events and exhibitions

Research Experience

Graduate Researcher 2021–Present

KAIST LAVA Lab

- Built end-to-end MR telepresence multi-user system: room scanning, spatial alignment, avatar embodiment, and networked interaction using Unity and Meta Quest
- Designed, developed, and evaluated methods for human motion adaptation in multi-user telepresence environments

Graduate Researcher 2020–2021

KAIST LAVA Lab

- Developed reinforcement learning-based locomotion controller for quadrupedal robot walking on non-rigid terrain

Awards and Honors

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- 2025: Excellence Award, Metaverse Developer Contest, RAPA
 - 2024: Best Demo Honorable Mention, IEEE ISMAR
 - 2021–2026: Fully Funded PhD Fellowship, KAIST
 - 2021: Tenacity Scholarship, KAIST
 - 2021: First Place, “Hello, World!: new playground”, Art Center NABI
 - 2018–2021: Fully Funded MS Fellowship, KAIST

Funded Research Projects

- 2024–2025: (Project Manager) Korea Radio Promotion Association (RAPA) – Mixed Reality Telepresence System
- 2023–2024: (Project Manager) National Research Foundation of Korea – Mixed Reality Scenes in Heterogeneous Spaces
- 2022–2023: (Project Manager) National Research Foundation of Korea – Perception and Motion Adaptation for Telepresence Avatars
- 2021–2022: Korea Institute for Advancement of Technology (KIAT) – VR/AR Expert Training Program

Technical Skills

- **Programming:** C#, Python, HLSL/shader programming
- **XR Development:** Unity, Mixed Reality Toolkit (MRTK), Photon networking
- **Hardware:** Meta Quest 2/3, Vive

Languages

Korean (Native), English (Fluent)

References

Sung-Hee Lee, Professor, School of Culture Technology, KAIST
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Jeongmi Lee, Associate Professor, School of Culture Technology, KAIST
Email: jeongmi@kaist.ac.kr

Woontack Woo, Professor, School of Culture Technology, KAIST
Email: wwoo@kaist.ac.kr

Additional references available upon request