



IXR '23: 2nd International Workshop on Interactive eXtended Reality

Irene Viola
Centrum Wiskunde & Informatica
Amsterdam, The Netherlands
irene.viola@cwi.nl

Stephanie Arévalo Arboleda
Ilmenau University of Technology
Ilmenau, Germany
stephanie.arevalo@tu-ilmenau.de

Hadi Amirpour
Klagenfurt University
Klagenfurt, Austria
hadi.amirpour@aau.at

Maria Torres Vega
KU Leuven & Ghent University
Leuven, Belgium
maria.torresvega@kuleuven.be

ABSTRACT

Despite remarkable advances, current Extended Reality (XR) applications are in their majority local and individual experiences. A plethora of interactive applications, such as teleconferencing, telesurgery, interconnection in new buildings project chain, Cultural Heritage, and Museum contents communication, are well on their way to integrating immersive technologies. However, interconnected, and interactive XR, where participants can virtually interact across vast distances, remains a distant dream. In fact, three great barriers stand between current technology and remote immersive interactive life-like experiences, namely (i) content realism, (ii) motion-to-photon latency, and accurate (iii) human-centric quality assessment and control. Overcoming these barriers will require novel solutions at all elements of the end-to-end transmission chain. This workshop focuses on the challenges, applications, and major advancements in multimedia, networks, and end-user infrastructures to enable the next generation of interactive XR applications and services.

CCS CONCEPTS

• **Human-centered computing** → **Virtual reality; Mixed / augmented reality; Collaborative interaction**; • **Networks** → *Network performance analysis*; • **Information systems** → *Multimedia streaming*.

KEYWORDS

eXtended reality, interactive experiences, XR interfaces, immersive experiences

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1 INTRODUCTION

Over the years the development and optimization of multimedia systems from traditional media (static 2D imagery and 2D video) to immersive media (manipulable 3D) have been tailored towards delivering better experiences in remote communication. This has been essential for enhancing the sensation of presence and interactivity provided by immersive media, where users are no longer passive consumers but assume active engagement and decision-making. The topic has attracted a lot of attention from academia as well as industry players, with several publications and patents published every year on the topic, in addition to relevant standardization efforts from organizations such as ITU, JPEG and MPEG.

Despite remarkable advances, current Extended Reality (XR) applications are in their majority local and individual experiences. A plethora of interactive applications, such as teleconferencing, tele-surgery, interconnection in new buildings project chain, Cultural Heritage and Museum contents communication, are well on their way to integrate immersive technologies. However, interconnected, and interactive XR, where participants can virtually interact across vast distances, remains a distant dream. In fact, three great barriers stand between current technology and remote immersive interactive life-like experiences, namely the (i) content realism, (ii) motion-to-photon latency, and accurate (iii) human centric quality assessment and control. Overcoming these barriers will require novel solutions at all elements of the end-to-end transmission chain. This workshop focuses on the challenges, applications, and major advancements in multimedia, networks and end-user infrastructures to enable the next generation of interactive XR applications and services.

After the success of the inaugural edition of this workshop in 2022, our purpose is to make this the reference venue in the area of interactive XR. Thus, we will be able to establish a long line of yearly workshops on the topic, to attract novel ideas, challenges, and solutions from both academia and industry addressing the aforementioned issues.

2 OBJECTIVE AND TOPICS OF INTERESTS

The objective of the workshop is to present and discuss new ideas, challenges, and solutions addressing interactive XR systems. In particular, we aim to explore system designs for interactive XR experiences; algorithmic solutions aiding in the compression and

delivery of contents for XR systems; and evaluation of human aspects in XR environments.

Topics of interest for this workshop include but are not limited to:

- Novel low latency encoding techniques for interactive XR applications;
- Novel networking systems and protocols to enable interactive immersive applications. This includes optimizations ranging from hardware (i.e., millimeter-wave networks or optical wireless), physical and MAC layers up to the network, transport, and application layers (such as over-the-top protocols);
- Significant advances and optimization in 3D modeling pipelines for AR/VR visualization, accessible and inclusive GUI, interactive 3D models;
- Compression and delivery strategies for immersive media contents, such as omnidirectional video, light fields, point clouds, dynamic and time-varying meshes;
- Quality of Experience management of interactive immersive media applications;
- Novel rendering techniques to enhance the interactivity of XR applications;
- Application of interactive XR to different areas of society, such as health (i.e., virtual reality exposure therapy), industry (Industry 4.0), and XR e-learning (according to new global aims).

3 WORKSHOP ORGANIZERS

- Irene Viola is a tenure-track researcher at the Centrum Wiskunde en Informatica in Amsterdam, The Netherlands. She received her M.Sc. in Computer Engineering from the Polytechnic University of Turin, Italy, in 2015, and her Ph.D. in Electrical Engineering from the Ecole Polytechnique Federale de Lausanne, Switzerland, in 2019. Her research interests include compression, delivery, and QoE for immersive media systems. She has served as a Qualinet chair for the task

force in Immersive Media Experiences since 2017 and is actively involved in standardization bodies such as MPEG and ITU. She has served as Technical Program Committee (TPC) chair for the ACM Multimedia Systems conference (MM-Sys) workshop Immersive Mixed And Virtual Environment Systems (MMVE) in 2021, for MMSys in 2022, for Quality of Multimedia Experiences (QoMEX) in 2023, and will be taking the same role for ACM International Conference on Interactive Media Experiences (IMX) in 2024. In March 2023, she organized the Spring School on Social XR in CWI, The Netherlands.

- Hadi Amirpour is a postdoc research fellow at Christian Doppler (CD) Laboratory ATHENA based at the University of Klagenfurt. He received his Ph.D. in computer science from the University of Klagenfurt in 2022. He received two B.Sc. degrees in Electrical and Biomedical Engineering and an M.Sc. degree in Electrical Engineering from the K. N. Toosi University of Technology. He was involved in the project EmergIMG, a Portuguese consortium on emerging imaging technologies, funded by the Portuguese funding agency and H2020. His research interests include video streaming, image and video compression, quality of experience, emerging 3D imaging technology, and medical image analysis. He has been involved in standardization committees such as JPEG Pleno and MPEG and he is currently co-chairing Qualinet TF7 since 2021. He has been involved in organizing special sessions, workshops, etc., in international conferences such as IEEE ICME 2023, ACM Multimedia 2022, IEEE EUVIP 2022, and ACM MobiSys 2022.
- Stephanie Arévalo Arboleda is a postdoctoral researcher at the Audiovisual Technology Group, Ilmenau University of Technology, Germany. She is interested in designing technology from a human-centered perspective. She received her Ph.D. from the University of Duisburg-Essen, Germany. She holds an M.Sc. in Human-Technology Interaction from the Tampere University of Technology in Finland and an MBA from the Pontificia Universidad Catolica del Ecuador

where she also obtained her engineering degree in Computer Science. Her research interests include mixed reality, human-robot interaction, multimodal interaction, assistive technologies, UX, interaction design, and empirical methods in HCI. She is a member of the Qualinet Task Force on Immersive Media Experiences. She is an active member of the SIGCHI community and Women in Robotics.

- Maria Torres Vega is a tenure track assistant professor at KU Leuven (Belgium), where her research focuses on devising human-driven control and management mechanisms for enhancing the perception of immersive systems. She received her M.Sc. degree in Telecommunication Engineering from the Polytechnic University of Madrid, Spain, in 2009 and her Ph.D. from the Eindhoven University of Technology, The Netherlands in 2017. Her research interests include quality of service and QoE in immersive multimedia systems and autonomous networks management. She currently serves as chair of the Qualinet Task Force on Immersive Media

Experiences. Moreover, she is a very active member of the multimedia and Quality of Experience community. For instance, she was the general chair of QoMEX 2023, and she has served as TPC chair of QoMEX 2021 and as publication chair of MMSys 2022.

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