

Measuring User Quality of Experience in Social VR systems

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ABSTRACT

Virtual Reality (VR) is a computer-generated experience that can simulate physical presence in real or imagined environments [7]. A social VR system is an application that allows multiple users to join a collaborative Virtual Environment (VE), such as a computer-generated 3D scene or a 360-degree natural scene captured by an omnidirectional camera, and communicate with each other, usually by means of visual and audio cues. Each user is represented in the VE as a computer-generated avatar [3] or, in recently proposed systems, with a virtual representation based on live captures [1]. Depending on the system, the user's virtual representation can also interact with the virtual environment, for example by manipulating virtual objects, controlling the appearance of the VE, or controlling the playout of additional media in the VE. The interest for social Virtual Reality (VR) systems dates back to the late 90s [4, 8] but has recently increased [2, 5, 6] due to the availability of affordable head-mounted displays on the consumer market and to the appearance of new applications, such as Facebook Spaces, YouTube VR, Hulu VR, which explicitly aim at including social features in existing VR platforms for multimedia delivery.

In this talk, we will address the problem of measuring user Quality of Experience (QoE) in social VR systems. We will review the studies that have analysed how different features of a social VR system design, such as avatar appearance and behavioural realism, can affect user's experience, and propose a comparison of the objective and subjective measures used in the literature to quantify user QoE in social VR. Finally, we will discuss the use case of watching movies together in VR and present the results of one of our recent studies focusing on this scenario, designed and performed in the framework of the European project VRTogether (<http://vrtogether.eu>). Particularly, we show an analysis of correlation between the objective and subjective measurements collected during our study, to provide guidelines toward the design of a unified methodology to monitor and quantify users' QoE in social VR systems. The open questions to be addressed in the future in order to achieve such goal are also discussed.

CCS CONCEPTS

• **Human-centered computing** → **User studies; Virtual reality; Collaborative interaction;** • **Computing methodologies** → *Virtual reality;*

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KEYWORDS

social virtual reality; QoE; collaborative virtual environment

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Brief Bio

Francesca De Simone is a tenure track researcher at the Distributed & Interactive Systems group of the Dutch National Research Institute for Mathematics and Computer Science (CWI), in Amsterdam, the Netherlands. She received her Ph.D. degree in computer and information science from the Swiss Federal Institute of Technology (EPFL), Switzerland in 2012. Before joining CWI, she worked as post-doctoral fellow in the Multimedia Signal Processing Group at Institut Mines Telecom ParisTech, France, as senior engineer in the cybersecurity department of Kudelski Security, Switzerland, and as post-doctoral fellow at the Signal Processing Laboratory LTS4 at EPFL, funded by a research grant from YouTube on the topic of omnidirectional video compression. Francesca serves as technical program committee member for many international conferences and as reviewer for IEEE, ACM and Elsevier Transactions. Recently, she has organised a special session on omnidirectional communications at IEEE MMSP 2017, was part of the organising committee of ACM MMSys 2018, and is part of organising committee of ACM MMSys 2019, where she will also be co-charing a special session on volumetric media. She has co-authored more than 50 peer-reviewed publications in top international conference and journals, winning the best student paper award at QoMEX 2008, the best paper award at ACM MMSys 2018, and the best student paper award at EUSIPCO 2018. Her research interests include immersive communications, multimedia quality assessment, image and video compression, and human perception.

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