OSA Incubator on Perception in Immersive Technologies

30 August - 2 September 2021

Hosted by:
Rigmor C. Baraas, University of South-Eastern Norway
Francisco Imai, Chair of the OSA Color Technical Group
Ali Özgür Yöntem, University of Cambridge
Jon Y. Hardeberg, Norwegian University of Science and Technology
Kaan Akşit, University College London

Monday, 30 August 2021

10:00 EDT **Welcome**
Elizabeth Rogan, CEO, The Optical Society

10:15 EDT **Program Overview & Goals**
Hosts

10:30 EDT **Keynote Talk: Augmented Reality Image Accuracy – Effects, Mitigation, Metrology**
Ilmārs Osmanis, LightSpace Technologies

11:30 EDT **Networking Break**

11:55 EDT **5 Minute Break**

12:00 EDT **Panel Discussion: Optical metrology for AR/VR displays and standardization of fundamental optical measures**

Topic Overview: Optical metrology, an essential tool for characterizing AR/VR near-eye displays, deals with optical measurements that ensure optical components consistently meet their desired specifications. Available specifications of AR/VR near-eye displays play a crucial role in designing and supporting AR/VR applications. Thus, in this part of the incubator, we focus on state-of-the-art optical metrology that helps to characterize important optical qualities of near-eye displays. These qualities include image resolution, accurate color reproduction capability, field of view and eye-box, brightness and contrast, and opto-mechanical stability of AR/VR near-eye displays. These qualities and characteristics are often reported differently by each manufacturer, leading to significant confusion while comparing different AR/VR devices. This session targets attendees from industry and academia to overcome such confusions by seeking means to unify descriptions of these qualities and characteristics, setting the grounds for industry standardization.

Panelists: Janne Simonen, OptoFidelity Ltd.
Lucas Klamer, Addoptics

13:00 EDT **Adjourn**

Tuesday, 31 August 2021

10:00 EDT **Keynote Talk: The Perception of Depth and Distance in Virtual Environments**
Laurie Wilcox, York University

10:45 EDT **Networking Coffee Break**

11:15 EDT **15 Minute Break**

11:30 EDT **Panel Discussion: Sensory-motor interaction and accessibility to the technology**

Topic Overview: The last few years have seen a rapid acceleration in fidelity and usability of XR technology, moving it from lab-based research to a common-place consumer item. Societal benefits include improved quality and efficiency for learning and training, indicating that XR has the potential to revolutionize education. Nevertheless, there are a number of barriers to the use of XR, including physiological problems (poor, or uncorrected eyesight, sensorimotor impairment) and the individual's learning and experiential history. Under this topic, we will not only discuss the role of stereopsis for optimal utilization of content in AR/VR, but also the role stereopsis plays when combining AR/VR with reaching and grasping, either using own hands/fingers, or haptic devices. We will also discuss the challenges with common eye problems and that a considerable part of the population either have poor stereopsis or lack stereopsis completely. This topic will be carried over to discussions on interactions and interfaces utilizing added sensory modalities.

Panelists: Constanze Hesse, University of Aberdeen
Ellen Svarverud, University of South-Eastern Norway
Jenny Read, University of Newcastle

13:00 EDT **Adjourn**

Wednesday, 1 September 2021

10:00 EDT **Keynote Talk: The Perception Equation: Only delivering what you need in Virtual Experiences**
Alan Chalmers, University of Warwick

10:45 EDT **Networking Coffee Break**

11:15 EDT **15 Minute Break**

11:30 EDT **Panel Discussion: Interactions and Interfaces**

Topic Overview: Although AR/VR/MR devices are mainly built to deliver visual experience, without the additional sensory stimulation of at least audio and touch sensation, the perceived experience is significantly limited. A fully immersive experience, which resembles the actual

physical case, can be created by simultaneous stimulation of these sensory components. Under this topic we will discuss not only the state-of-the-art User Interfaces (UI) for immersive experience in AR/VR/MR/XR, but also investigate the possible near future technological advancements to support User Experience (UX). We will specifically investigate audio and haptics technologies, external sensing devices, e.g., depth cameras, ToF, internal sensing devices, e.g., eye tracking, head tracking, for depicting seamless integration of these units for improving perceived User Experience. Moreover, this topic will set the ground for the discussion for the use cases and applications.

Panelists: Daisuke Iwai, Osaka University
Philip Jackson, University of Surrey
Sriram Subramanian, University College London

13:00 EDT **Adjourn**

Thursday, 2 September 2021

10:00 EDT **Keynote Talk: Technical Challenges of Mixed Reality Technology**
Anthony Steed, University College London

10:45 EDT **Networking Coffee Break**

11:15 EDT **15 Minute Break**

11:30 EDT **Panel Discussion: Content, Use Cases and Applications - In Search of the Killer Application**

Topic Overview: As the integration of visual experience with other sensory stimulation is in progressive leading to a fully immersive experience it is also important to focus on which applications would lead to a mass adoption of AR/VR/MR technologies. Some of the promising areas of application are medical, collaborative work, training, education and entertainment. It is necessary to look into how different aspects of perception can enable different classes of applications.

Panelists: Cengiz Öztireli, University of Cambridge
Elizabeth McMahon, Clinical Psychologist *(private practice)*
Nikhil Balram, EyeWay Vision Inc.

13:00 EDT **Adjourn**