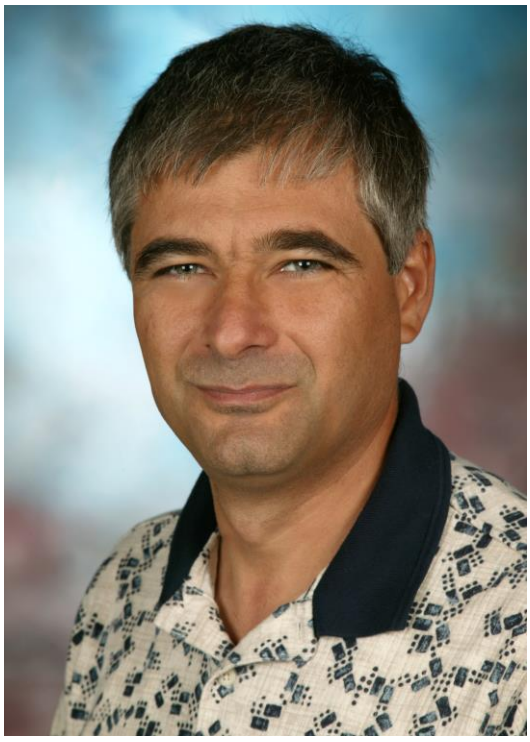
Spatial Audio for Virtual and Augmented Reality Devices

ABSTRACT: Virtual and augmented reality devices are a hot topic for research and product development. In most of the cases these devices come in the form of head mounted displays. Integral part of these devices are several audio subsystems: spatial audio rendering, capture of the user's voice and capturing the environmental audio.

Unlike the vision, where humans have approximately 90^{o} field of view, human hearing covers all directions in all three dimensions. This means that the spatial audio system of these devices is expected to provide realistic rendering of sound objects in full 3D to complement the stereoscopic rendering of the visual objects.

In this tutorial, we will discuss the problems and potential solutions around the spatial audio subsystem in the devices for virtual and augmented reality. These include the Head-Related Transfer Functions (HRTFs) personalization, generation of the proper reverberation and distance cues. Most of the problems and solutions have broader scope and affect everyday scenarios such as listening to stereo music with headphones and watching movies on mobile devices.

BIO: Dr. Ivan Tashev received his Master's degree in Electronic Engineering in 1984 and PhD in Computer Science in 1990 from Technical University of Sofia, Bulgaria. He was Assistant Professor in the Department of Electronic Engineering of the same university in 1998, when moved to Microsoft in Redmond, USA. Currently Dr. Tashev is a Partner Software Architect and leads the Audio and Acoustics Research Group in Microsoft Research Labs in Redmond, USA. Ivan Tashev is a senior member of IEEE since 2006, member of Audio Engineering Society since 2006. Serves as member and associate member of IEEE SPS Audio and Acoustics Signal Processing Technical Committee and IEEE SPS Industrial DSP Standing Committee. Since 2012 he is adjunct professor in the Department of Electrical Engineering of the University of Washington in Seattle, USA.



Dr. Tashev published two scientific books as the sole author, wrote chapters in two other books, authored or coauthored more than 70 publications in scientific journals and conferences. Ivan Tashev is listed as inventor of 50 USA patent applications, 31 of them already granted. The audio

processing technologies, created by Dr. Tashev, have been incorporated in Microsoft Windows, Microsoft Auto Platform, and Microsoft Round Table device. Dr. Tashev served as the leading audio architect for Kinect for Xbox and Microsoft HoloLens. More details about him can be found in his web page https://www.microsoft.com/en-us/research/people/ivantash/.