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Getting into Vitual Reality

The topic of this special issue is immersive interactive technologies. It represents one of the "modern" topics in DSP and is at the intersection of the traditionally separate areas of computer animation, computer vision, graphics, speech and audio processing, image and video processing, and communications (not to mention psychology, physiology, kinesiology, and control). Such R&D topics act as a catalyst in bringing together researchers from outside the digital signal processing area, and this is clear by looking at the authors in this issue. Each article brings a different perspective to the discussion.

The objective of immersive interactive technologies is to build a virtual environment that provides users with the sense of immersion. In virtual conferencing and collaboration applications, for example, the objective is to give participants the feeling that they share the same three-dimensional (3-D) space. Even when thousands of miles away, the system allows participants to have the same possibilities in interacting as if they were physically in a single office, lab, or conference room. They can look at the same blueprint or blackboard (or whiteboard), and they can all touch and interact with the same 3-D object. There are numerous efforts and products directed towards this objective, but there is much progress to be made before we achieve a truly immersive environment. A colleague was telling me that he has tried all means available to him to keep remotely advising his students. Still nothing he finds can replace the experience of flying back and sitting at the same table with his students and colleagues.

Another objective of immersive interactive technologies is to augment the physical world experience of an individual. These systems are typically the subject of science fiction literature and movies. For example, a user is tracked by a "machine" and his or her intentions and thoughts and moods are understood by the machine automatically at all times. The person is not constrained to sit at the desk in front of the monitor (getting computing "off the desktop," "pervading" the physical world, and connecting with what other users are doing are different definitions of *ubiquitous computing*) or hold or wear (*wearable computing*) a portable device that is wirelessly connected to the rest of the world (*ubiquitous communications*). Instead, every motion, facial expression, or even secret thought (as described by his/her EKG) is interpreted (*multimodal interaction*).

Users can represent themselves with an avatar. (This word derives from the Sanskrit AVATARA, which means "descent," according to the *Encyclopedia Britannica*. In Hinduism, avatar means the incarnation of a deity in human or animal form to counteract some particular evil in the world.) Representative of ourselves, an avatar may or may not look like us; he could be a "digital clone"—hopefully this will never be too controversial or illegal—or the handsome creature from the fairy tales that

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never gets tired or ages. The avatar's actions and behavior are driven by our actions; i.e., speech, movements, and emotions. This requires efficient real-time algorithms to process the raw speech signal, images, and video (from a single camera or multicameras) and to represent the extracted information in a compressed form. There is quite a bit of "traditional" signal processing in carrying

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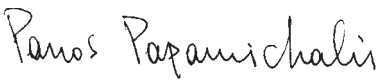
the majority of potential attendees to come to the conference. Some very successful conferences have chosen, year after year, the same venue; or, they rotate between two or three locations. Should we consider the same approach? (Any change in policy, though, will have to wait at least until 2005 because the venues have already been chosen.)

So, I hope I will see you at ICASSP—this year, and every year!



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out such tasks (i.e., speech analysis/synthesis, image and video segmentation, and motion estimation and tracking, among others). Such avatars live and move in a virtual synthetic or real world. The rendition of this world can be done using computer graphics techniques or photorealistic 3-D image spaces or a combination of the two (*augmented reality*).

Finally, different ways to interface with this new representation of the physical world need to be devised. Stereoscopic displays, head mount devices, and complicated display systems, such as CAVE, provide some means for such a visual interface. Life in a CAVE is a very rewarding experience, and I encourage you to visit one nearest you!

This is an exciting research topic that is expected to keep generating a lot of interest and exciting applications. In fact, MPEG-4, the recent multimedia compression standard, addresses interactivity, as well as the encoding of synthetic scenes and facial animation parameters which can be used to animate a 3-D facial model.

All these exciting aspects of immersive virual reality are addressed in the six articles of this well-thought-out special issue. Dr. Ichikawa was responsible for putting it together and provides an introduction to it. His efforts are greatly appreciated.

Enjoy the issue and ICASSP! I hope to meet some of you in Salt Lake City, as the experience of "being there" cannot be replaced by any state-of-the-art immersive reality system.

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