# Guest Editor's Introduction Special Section on the Virtual Reality Conference (VR)

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T HE IEEE Virtual Reality (VR) Conference is the leading forum for the dissemination of the latest research in VR. This special section features significantly expanded versions of the four best papers from the IEEE VR 2009 Proceedings. The four papers illustrate the range and depth of work that appears at the IEEE VR Conference: from new technologies through to user impact studies. We would like to express our sincere gratitude to the anonymous reviewers who have diligently assisted us in attaining the highest quality for this special section.

Accurate, low-latency tracking is an essential component of any immersive virtual reality system, but it is a component that can be expensive. In "JanusVF: Accurate Navigation Using SCAAT and Virtual Fiducials," Malcom Hutson and Dirk Reiners describe a new low-cost tracking system for surround virtual reality systems. They take fiducial-based tracking, which is common in augmented reality systems, and integrate it with virtual reality. However, to make sure that the markers do not interfere with the view of the user, they use virtual markers rendered over the normal visuals, and place these markers behind the user. A camera is mounted on the user's head but facing backward. This camera can accurately track the fiducials and the fiducials are kept out of the user's field of vision.

One of the important features of virtual reality simulations is that they allow hypotheses about human behavior to be tested in a safe environment. An excellent demonstration of this can be found in the paper by Sabarish Babu, Timofey Grechkin, Benjamin Chihak, Christine Ziemer, Joseph Kearney, James Cremer, and Jodie Plumert, which is concerned with the application of virtual reality to road safety. Their paper, "An Immersive Virtual Peer for Studying Social Influences on Child Cyclists' Road-Crossing Behavior," presents the description of a peer cyclist that can accompany a child cyclist. The virtual cyclist interacts with the child in several ways. In a study with children, they found that the behavior of the virtual cyclist had a significant impact on the risk-taking of the children.

One goal of virtual reality technology is creating realistic simulations of the real world. Today, the visual simulation quality of virtual environments can be extremely high.

However, the behavior is often simple. Moreover, we might want to reproduce real situations. In their paper "Virtualized Traffic: Reconstructing Traffic Flows from Discrete Spatio-temporal Data," Jason Sewall, Jur van den Berg, Ming C. Lin, and Dinesh Manocha show how to reproduce traffic flow in simulations based on traffic counts. From a small number of discrete observations of a vehicle, they can reproduce its path. This would be relatively simple for a single car, but they do it for high-density traffic situations. The output trajectories for each vehicle maintain constraints of car behavior, both at the low-level (e.g., dynamics) and the high-level (e.g., safe driving and lane changing).

The final paper in this special section deals with an imaginative use of augmented reality. The paper "A Spatially Augmented Reality Sketching Interface for Architectural Daylighting Design" by Yu Sheng, Theodore Yapo, Christopher Young, and Barbara Cutler describes the Virtual Heliodon. A heliodon is an apparatus typically used by architects and designers which can position a light source above a physical model to demonstrate what the final artifact will look like under different lighting situations. For example, a model of a building might be placed in the heliodon to examine how the different facades of the building are illuminated by the sun at different times of the day. The virtual heliodon uses augmented reality to achieve similar aims in a more flexible way. A virtual model of the real model is captured by a camera. This virtual model is illuminated using a hybrid rendering model. The resulting illumination is then projected back on to the real model using an array of four projectors.

Finally, thanks to Dirk Reiners, who was the other program chair of IEEE Virtual Reality 2009 and who helped instigate this special section.

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