Preface to the Special Issue on Cyberworlds 2012

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This Special Issue is devoted to the state-of-the-art research on virtual worlds. It contains extended versions of six papers presented at the International Conference on Cyberworlds 2012, Darmstadt, Germany. According to the Cyberworlds conference mission statement, “created intentionally or spontaneously, cyberworlds are information spaces and communities that immensely augment the way we interact, participate in business and receive information throughout the world. Cyberworlds seriously impact our lives and the evolution of the world economy by taking such forms as social networking services, 3D shared virtual communities and massively multiplayer online role-playing games.”

The six presented papers are all connected by this similar focus on virtual worlds. Specifically, their focus is on shape modeling and web visualization, distributed/network graphics in virtual reality, path planning and automatic waypoint graph generation for surface and volumetric motions, haptic rendering and virtual coupling for dynamic simulation, animation of traditional dance using motion synthesis, composition and capture, and mobile augmented reality for building information management using sensor fusion and markerless tracking.

In the first paper, “*Interactive Free-form Shape Modeling in Cyberworlds*”, Danbo Lai and Alexei Sourin propose an algorithm for accelerating rendering for free-form shape modeling where some initial shape is gradually modified by other implicitly-defined shapes with relatively smaller sizes compared to the final shape. The accelerated function scripts can be rendered on any suitable rendering platform

which is illustrated by using a function-based extension of VRML/X3D and POV-Ray.

“*Extending a Distributed Virtual Reality System with Exchangeable Rendering Back-ends—Techniques, Applications, Experiences*” by Karsten Schwenk and colleagues, is the second paper and it presents an approach to integrate multiple rendering back-ends under a common application layer for distributed systems. In order to find a practical and non-intrusive way to use potentially very different renderers in heterogeneous computing environments without impairing their strengths and without burdening the back-ends or the application with details of the cluster environment, they propose a mediator layer that handles multithreading, clustering, and the synchronization between the application’s and the back-end’s scene.

The third paper, “*Enhanced Waypoint Graph for Surface and Volumetric Path Planning in Virtual Worlds*” by Nicholas Mario Wardhana and colleagues, focuses on the problem of path planning in 3D virtual world applications. The authors propose a mechanism to generate an enhanced waypoint graph in a virtual world, as well as showing how to use the graph to plan surface and volumetric motions for characters with various sizes. The generation pipeline includes environment subdivision, voxelization, local and border waypoint generation, traversability graph construction, and incremental sparsification.

In the fourth paper, “*Stable Adaptive Algorithm for Six Degree-of-freedom Haptic Rendering in Dynamic Environment*”, Xiyuan Hou and Olga Sourina present an adaptive 6-DOF haptic rendering algorithm based on virtual coupling. By automatically adjusting parameters of the virtual coupling according to the mass values of virtual tools, the displacement in the virtual coupling is minimized making the haptic manipulation more accurate. An additional force saturation algorithm for the dynamic virtual coupling force cal-

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ulation allows for a gradual force growth and force saturation when deep contact occurs or fast movement of the virtual tool is needed.

The fifth paper, “*Easy-To-Use Authoring System for Noh (Japanese Traditional) Dance Animation and its Evaluation*” by Masaki Oshita and colleagues, presents a practical easy-to-use authoring system for creating Noh dance animations based on Noh dance notation by using a smart motion synthesis method. The authors show that the system can be used to create Noh dance animations efficiently even by users who do not have much knowledge of motion editing and experience with using animation systems.

In the sixth and last paper, “*Augmented Reality Supporting User-Centric Building Information Management*”, Manuel Olbrich and colleagues present a mobile AR framework as well as an annotation engine, which provides the basis for mobile AR applications that support the building life cycle by integrating virtual information with the real environment. The presented system is flexible and scalable, as a result of which distributed Building Information Models AR applications can be realized on arbitrary devices.

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Arjan Kuijper received his MSc from the Department of Applied Mathematics at the University of Twente in the Netherlands. He then worked as a software analyst, consultant, and advisor for the ELTRA Parking Group, a company that sells and maintains hand-held computers and related software. Dr. Kuijper then began working towards his doctorate through the Department of Computer Science and Mathematics at Utrecht University, completing his PhD in 2002 on, “The Deep Structure of Gaussian Scale Space Images,” while he also worked as a researcher. Dr. Kuijper immediately began his post-doctoral work on 3D multi-modality matching, also at Utrecht University. In 2003, he became assistant research professor at The Image Group at the IT University of Copenhagen, Denmark, working on shape analysis. Next, Dr. Kuijper served as a scientific consultant for the Wolfgang Pauli Institute in Vienna, Austria. In November 2005 he became senior researcher at the Johann Radon Institute for Computational and Applied Mathematics (RICAM) in Linz, Austria, working on PDE approaches for image and shape analysis with the Analysis of Partial Differential Equations group. Since November 2008, Dr. Kuijper has been the manager of scientific dissemination at the Fraunhofer Institute for Computer Graphics Research (IGD) in Darmstadt, Germany. He obtained his *venia legendi* (habilitation) at the TU Graz in 2009 and at the TU Darmstadt in 2010, where he is now appointed as senior lecturer (Privat Dozent). Dr. Kuijper is the author of numerous publications, serves as reviewer for many journals and conferences, and is both a program committee member and as an organizer for conferences. His research interests cover all aspects of mathematics-based methods for computer vision, image processing, computer graphics and pattern recognition.