Guest Editors' Introduction: Special Section on the ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (I3D 2012)

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THIS special section includes extended versions of four of the best papers presented at the ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (I3D) 2012. I3D 2012 was held from 9-11 March 2012 in Costa Mesa, California. This 2012 edition of the symposium was its 16th meeting, and it was, for the first time, collocated with IEEE Virtual Reality (VR) and the IEEE Symposium on 3D User Interface (3DUI). This annual event continues to be a stimulating and collegial meeting place for researchers, practitioners, students, and enthusiasts in the area of interactive computer graphics techniques. Additional information about the I3D symposium can be found at http://www.i3dsymposium.org/.

I3D 2012 received 63 paper submissions, of which 25 were selected by a rigorous peer review process. Each submitted paper was reviewed by members of the International Program Committee (IPC), who then carefully weighed the technical contributions and merits of each paper in an extensive online discussion phase. Based on these reviews and the quality of the oral presentations at I3D 2012, a committee consisting of the Symposium Cochairs, Program Cochairs, and five additional members identified the best papers to be considered for this special section. The invited authors extended their original papers with considerable additional material, and these extended versions were carefully reviewed again before being accepted for inclusion here. The result is a special section which presents some of the finest recent work on interactive 3D graphics, newly expanded with details, insights, and recent results.

In "Painting with Polygons: A Procedural Watercolor Engine," the authors Stephen DiVerdi, Aravind Krishnaswamy, Radomír Měch, and Daichi Ito introduced a lightweight procedural algorithm for generating dynamic watercolor paintings on a mobile device such as a laptop or iPad. Their algorithm is driven by the aesthetics and artistic appearance of watercolor paintings, and models each stroke using a vector-based representation. This allows the rendering to be performed at arbitrary resolution. In addition, they introduced an efficient pigment advection algorithm suitable for devices with low computation power. Finally, they demonstrated the technique in a commercially available app used by professional artists.

In "Computing 2D Constrained Delaunay Triangulation Using the GPU," the authors Meng Qi, Thanh-Tung Cao, and Tiow-Seng Tan presented the first GPU-based solution for computing 2D constrained Delaunay triangulations (CDT) from planar straight line graphs. While many CPU-based algorithms exist in computational geometry for solving CDT problems, no prior approach has fully utilized the parallel computation power of the GPU to tackle this problem. The main technical contribution is a novel algorithm, named gCD, for computing the CDT of a planar straight line graph consisting of both points and edges. By solving the problem entirely on the GPU, the authors achieved a fast and numerically stable algorithm that is up to an order of magnitude faster than the CPU equivalent.

In "Interactive Rendering of Acquired Materials on Dynamic Geometry Using Frequency Analysis," the authors Mahdi Mohammad Bagher, Cyril Soler, Kartic Subr, Laurent Belcour, and Nicolas Holzschuch presented a new approach for reducing the computation cost of rendering complex acquired materials. They accomplished this by performing a frequency analysis based on the local light field arriving at every shading pixel as well as the variance of the shading integrand. A variety of factors are considered, including the reflectance function, illumination, local geometry, and camera position. By leveraging this analysis, they enable efficient adaptive sampling that requires fewer samples and subpixels to accurately render complex reflectance effects, such as highly glossy acquired materials.

In "Interactive Animation of 4D Performance Capture," the authors Dan Casas, Margara Tejera, Jean-Yves Guillemaut, and Adrian Hilton introduced a 4D parametric motion graph representation for interactive animation captured from a performance in a multiple camera studio. The motion graph representation is based on a 4D model database of temporally aligned mesh sequences. High-level movement controls are achieved by a novel algorithm that blends multiple mesh sequences in real-time. Transitions between different parametric motion spaces are evaluated based on surface shape and motion similarity. This approach enables interactive character animation and control, while preserving the natural appearance and dynamics of captured performance.

We would like to thank the IPC, external reviewers, and the reviewers for the extended submissions, for providing detailed and thoughtful feedback that helped ensure the

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quality of the final papers. We would also like to thank the Symposium Cochairs for making the symposium a great success. We must also thank all of the authors for submitting their work, for supporting this event, and for contributing their efforts, insights, and original ideas. Finally, we thank *IEEE Transactions on Visualization and Computer Graphics* (*TVCG*) for providing this special section to showcase the work published at I3D 2012, and we hope that you enjoy the papers that follow.

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Guest Editors

Michael Garland received the BS and PhD degrees in computer science from Carnegie Mellon University. He is a senior manager at NVIDIA, where he leads the Programming Systems & Applications Research Group. His current research interests include graph and mesh processing, parallel algorithm design, and programming models and languages for massively parallel machines.

Rui Wang received the BS degree from Zhejiang University in 2001 and the PhD degree from the University of Virginia in 2006. He is currently an associate professor in the Department of Computer Science at the University of Massachusetts (UMass) Amherst. His research interests are in the field of computer graphics, with focuses on global illumination, interactive image synthesis, stochastic sampling, GPU-based rendering, and general-purpose computation. He received a US National Science Foundation (NSF) CAREER Award in 2008, and cochaired ACM I3D in 2012.