Foreword

Foreword to special section on Virtual Environments and Applications

1. Introduction

Virtual environments serve both to simulate physical places in the real world, as well as imaginary worlds. Most current virtual environments are primarily visual experiences, displayed either on a conventional computer screen or viewed through special stereoscopic displays. While user experiences in virtual environments can parallel those in real world to create, they can also differ significantly from reality such as those in VR games.

Virtual environments enjoy a wide range of applications from education and training, to scientific exploration and visualization, design and prototyping, medical diagnosis and digital entertainment. While it is still difficult to create high-fidelity virtual experiences, due largely to technical limitations on processing power, image resolution, and communication bandwidth, considerable efforts have been made to approach these problems.

The ACM VRCAI 2011 conference [1] sought to provide a forum to share experiences, to exchange ideas and to spur advances in this fast-growing field. Virtual Environments and Applications were covered in nearly 100 presentations at the conference. Authors of the best contributions were invited to submit further significantly revised and extended versions to this special section on Virtual Environments and Applications.

This special section includes five submissions on interactive or real-time techniques in virtual environments, including immersive visualization of 3D massive models, simulation of ink diffusion, camera control for 3D navigation, user guided antialiased edit and retexturing images and videos.

Marton et al. [2] describe an approach to natural immersive exploration of extremely detailed surface models. Their virtual environment gives multiple, freely moving, naked-eye viewers the illusion of seeing and manipulating 3D objects with continuous horizontal parallax. The specialized 3D user interface allows inexperienced users to inspect 3D objects at various scales, integrating panning, rotating, and zooming controls into a single low-degree-of-freedom operation.

Xu et al. [3] present a real-time and realistic simulation technique of ink diffusion processes. Their particle-guided method facilitates user interaction while allowing artists to design the overall state using the coarse-resolution particles and to preview ink motions quickly. The ink is rendered using particle sprites and motion blurring techniques, implementing both the simulation and the rendering on graphics hardware. The method allows easy control over ink animation, including basic solid–fluid interactions and multiple ink interactions.

Serin et al. [4] present a novel approach to virtual camera control for navigation over a 3D terrain using best viewpoints. They exploit Viewpoint Entropy for best view determination and use Greedy N-Best View Selection to expedite visibility calculations. Furthermore, they integrate road network data to extract regions for detailed visibility analysis in subsections of the terrain. In order to connect the calculated viewpoints, they apply an evolutionary programming approach to solve the Traveling Salesman problem.

Ma and Xu [5] present a simple algorithm using AntiAlias Maps to overcome aliasing artifacts in edit propagation. The key to their method is a new representation, where each antialiased edge pixel is a linear interpolation of neighboring pixels around the edge. Instead of considering the original edge pixels in edit propagation, those neighboring pixels are used. Their results show that their approach is effective in preserving antialiased edges for edit propagation and could be easily integrated to existing edit propagation methods.

Finally, Li et al. [6] present an interactive retexturing technique preserving similar underlying texture distortion between the original and retextured images/videos. Their system offers real-time feedback interaction for easy control of target object definition, texture selection with size adjustment and overall lighting tuning thanks to GPU parallelism. They use SIFT corner features to naturally discover the underlying texture distortion. Gradient depth recovery and wrinkle energy optimization are applied to accomplish the desired distortion.

As their applications expand, virtual environments attract more attention and become enablers of new research. We hope that the work described in this section will motivate others to contribute high quality results to future events and activities.

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References


