Virtual Environments 2005

9th International Workshop on
Immersive Projection Technology

11th Eurographics Symposium on Virtual Environments

Aalborg, Denmark
October 6 – 7, 2005

Workshop Co-Chairs
Erik Kjems, VR Media Lab, Aalborg University (EGVE)
Roland Blach, Fraunhofer IAO Stuttgart, Germany (IPT)

IPT-Liaison USA
Carolina Cruz-Neira, VRAC, Iowa State University, USA

Proceedings Production Editors
Dieter Fellner (Graz University of Technology, Austria)
Stephen Spencer (The University of Washington, USA)

Sponsored by EUROGRAPHICS Association in cooperation with ACM SIGGRAPH
# Table of Contents

Table of Contents ................................................................. 3  
Preface .................................................................................... 7  
Supporters .............................................................................. 8  

## Technology

Low-Cost, Portable, Multi-Wall Virtual Reality ................................................. 9  
*Samuel A. Miller, Noah J. Misch, and Aaron J. Dalton*

Using a single Spatial Light Modulator for Stereoscopic Images of High Color Quality and Resolution ............................................................ 15  
*Armin Hopp*

Imperceptible Projection Blanking for Reliable Segmentation within Mixed Reality Applications ......................................................... 23  
*Martin Kuechler and Andreas Kunz*

Binaural Acoustics For CAVE-like Environments Without Headphones .................. 31  
*Ingo Assenmacher, Torsten Kuhlen, and Tobias Lentz*

## Tracking

Optical Tracking and Calibration of Tangible Interaction Devices ......................... 41  
*Arjen van Rhijn and Jurriaan D. Mulder*

Näprä - Affordable Fingertip Tracking with Ultrasound ....................................... 51  
*Markku Reunanen, Karri Palovuori, Tommi Ilmonen, and Wille Mäkelä*

## Systems

Running Large VR Applications on a PC Cluster: the FlowVR Experience ............... 59  
*Jérémie Allard, Clément Ménier, Edmond Boyer, and Bruno Raffin*

A Game Engine-based Multi-Projection Virtual Environment with System-Level Synchronization ................................................................. 69  
*Naoki Hashimoto, Yoshihiko Ishida, and Makoto Sato*

Towards a General Concept for Distributed Visualisation of Simulations in Virtual Reality Environments ......................................................... 79  
*Joscha Metze, Benjamin Neidhold, and Markus Wacker*

Dynamic Bounding Volume Hierarchies for Occlusion Culling ................................ 91  
*Vít Kovalčík and Petr Tobola*

## Applications

Modeling of Trees with 3D Gestures and Growth Simulation .................................... 97  
*Norishige Murakami, Katsuhiko Onishi, Yoshifumi Kitamura, and Fumio Kishino*
Table of Contents

Real-time Deformation of Detailed Geometry Based on Mappings to a Less Detailed Physical Simulation on the GPU ................................................................. 105
  Jesper Mosegaard and Thomas S. Sørensen

Augmented Reality Interaction for Semiautomatic Volume Classification ........................................ 113
  Angel del Río, Jan Fischer, Martin Köbele, Dirk Bartz, and Wolfgang Straßer

Feature Tracking in VR for Cumulus Cloud Life-Cycle Studies ...................................................... 121
  Eric J. Griffith, Frits H. Post, Michal Koutek, Thijs Heus, and Harm J. J. Jonker

Distributed Software-Based Volume Visualization in a Virtual Environment .................................. 129
  Anton L. Fuhrmann, Reiner C. Splechtna, Lukas Mroz, and Helwig Hauser

Language Learning in Virtual Environments: ‘Bobo and Apples’ ................................................. 141
  Hee Holmen and Finn Nielsen

Interaction I

Interacting with Molecular Structures: User Performance versus System Complexity .................... 147
  Robert van Liere, Jean-Bernard O. S. Martens, Arjan J. F. Kok, and Martijn H. A. V. van Tienen

Attribute Correlations between Haptic and Auditory Modalities ............................................... 157
  Bridget Baird, Özgür Izmirli, Bradford Heacock, and Donald Blevins

Virtual Pockets in Virtual Reality ................................................................................... 163
  Tommi Ilmonen and Markku Reunanen

Evaluation of Collaborative Construction in Mixed Reality ......................................................... 171
  Breght R. Boschker and Jurriaan D. Mulder

Interaction II

Pseudo-Physical Interaction with a Virtual Car Interior in Immersive Environments ..................... 181
  Mathias Moehring and Bernd Froehlich

Tangible 3D: Hand Gesture Interaction for Immersive 3D Modeling ............................................ 191
  Hyosun Kim, Georgia Albuquerque, Sven Havemann, and Dieter W. Fellner

Color Plate ..................................................................................................................... 233

IntenSelect: Using Dynamic Object Rating for Assisting 3D Object Selection ............................ 201
  Gerwin de Haan, Michal Koutek, and Frits H. Post

Reducing Fragmentation in Telecollaboration by Using IPT Interfaces ....................................... 211
  Dave Roberts, Majda Al-Liabi, Robin Wolff, Oliver Otto and A. Al-Khalifah
# Table of Contents

## Practice and Experiences

Experience of a Hybrid Information Space between an Outdoor Field and an Immersive Virtual World ................................................................. 217  
_Tetsuro Ogi and Tetsuro Fujise_

Applications of Augmented Reality for Maintenance Training .......................... 219  
_Dongdong Weng, Yongtian Wang, and Yue Liu_

Enhanced Hand Manipulation for Efficient and Precise Positioning and Release .................. 221  
_Noritaka Osawa_

Towards Better Quality in Virtual Environments ........................................... 223  
_Florian Mannuß and André Hinkenjann_

Colosseum3D - Authoring framework for Virtual Environments ...................... 225  
_Anders Backman_

International Program Committee ................................................................. 227  
External Reviewers .................................................................................. 228  
Author Index ......................................................................................... 229  
Cover Image Credits .............................................................................. 230  
Color Plates ......................................................................................... 231
Preface

This book contains the proceedings of the joint 9th International Immersive Projection Technologies Workshop and the 11th EUROGRAPHICS Virtual Environments Workshop (IPT-EGVE). The event was held in Aalborg, Denmark the 6. and 7. October 2005. It was organized at the VR Media Lab, Aalborg University in co-operation with the Fraunhofer IAO in Stuttgart and EUROGRAPHICS together with ACM SIGGRAPH.

The workshop brought together scientists, developers and users from around the world. The latest scientific advances in the field of Immersive Projection Technologies and Virtual Environments were presented and discussed.

There were 47 papers submitted for reviewing and 29 were presented at the workshop.

A keynote presentation was given by Anthony Steed from UCL, London. He presented an overview on a re-emerging topic in virtual environments research: Collaboration in virtual environments. He summarized the experiences of the UCL over the last years in his talk "Collaboration at a Distance: How good can it be?" The IPT-EGVE workshop was organized in an audience friendly one track session covering five major themes: Technology, Tracking, Applications, Systems and Interaction.

The editors want to thank everyone involved in the process of creating these proceedings, in particular the program committee and affiliated reviewers who have contributed with a heavy workload just before the summer holidays. But also a great thanks to the authors of these proceedings for their fine papers we were allowed to publish.

Special thanks go to Heinrich Müller for his assistance on behalf of the EUROGRAPHICS and the local organizing team at VR Media Lab, especially centre secretary Lise Suhr Mogensen.

Aalborg, Stuttgart, August 2005

Erik Kjems and Roland Blach
Supported by

Fraunhofer Institut Arbeitswirtschaft und Organisation
CC Virtual Environments
Fraunhofer IAO

FpF Verein zur Förderung produktionstechnischer Forschung e. V. (FpF), Stuttgart

AALBORG UNIVERSITY VR Media Lab, University of Aalborg

Eurographics Association

ACM SIGGRAPH