New Visual Services on Distributed Displays and the Internet

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Overview

- Introduction
  - Intel Visual Computing Institute
- Distributed display techniques
  - Display as a service
  - Hybrid rendering
- Tools for content creation
  - Performance capture
  - User-centric video processing
- Internet delivery
  - XML3D + XFlow
- Summary
<table>
<thead>
<tr>
<th>Institute Members</th>
<th>Website</th>
</tr>
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<tbody>
<tr>
<td>Intel Corporation</td>
<td><a href="http://www.intel.com">http://www.intel.com</a></td>
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<td>Saarland University</td>
<td><a href="http://www.uni-saarland.de">http://www.uni-saarland.de</a></td>
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<td>DFKI</td>
<td><a href="http://www.dfki.de">http://www.dfki.de</a></td>
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<td>MPI for Informatics</td>
<td><a href="http://www.mpi-inf.mpg.de">http://www.mpi-inf.mpg.de</a></td>
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Virtual Worlds (Model-based)

- Scalable Algorithms for Real Time Realistic Rendering
- Scalable Hybrid Rendering for Large Scale Visualization
- Multi Touch Interaction Techniques for Mixed 2D and 3D Graphics Displays
- Large Scale Visualization in the Internet of Displays
- Kusanagi: Coding and Interaction for Networked Games

Real Worlds (Sample-based)

- Marker-free Performance Capture
- Open Infrastructure for 3D Web applications
- Visualization and editing of light transport
- Internet Transport and Coding for 3D HD-TV
- Efficient Multi-View Video Streaming System

Multimodal Scene Analysis & Interaction

- Efficient High Quality Rendering Using Sample-based Representations
- High-Quality Rendering and Visualization for Artistic Manipulation
- Open-based Shape Analysis and Modeling
- Visualization and editing of light transport
- Efficient Multi-View Video Streaming System

Intel VCI Vision

- Compiler Support for High Performance Graphics
- Advanced Ray Tracing and Data-Flow Processing for the 3D Internet
- Collaborative Distributed Molecular Modeling and Visualization
- SCENE: Novel Scene Representations for Richer Networked Media
- VERVE: Vanquishing fear and apathy through E-inclusion
- Device-Independent Multi Reality Interfaces
Display as a Service
Alexander Löffler

- Virtualizing Displays over the Internet
  - Applications provide **Virtual Framebuffers**
  - Displays provide **Virtual Displays**
  - Arbitrary N:M mapping of FBs onto displays
  - P2P streaming of content over IP network

- **Novel features**
  - **Displays walls** appear as one Virtual Displays
  - **Parallel rendering** into FBs across cluster
  - **Full synchronization** between displays
  - **Reverse genlock** sent from display to FB

- **Results**
  - SW-based virtual video crossbar
  - Significant industry interest, available now
  - CeBIT Innovation Award, March 2013
Scalable Hybrid Rendering for Large Scale Visualization

Jens Krüger

Results

- Hybrid rendering demonstrator
- Deployment of rendering cluster
- Grid leaping DVR algorithm
- 8 releases of ImageVis3D (Mobile)
- 9 publications in 2012
- Demos: ERIC, SC, IEEE VisWeek, ...

Demo at Research@Intel 2013
San Francisco, June 24-25
Optical Performance Capture
Christian Theobalt

Goal
- The next generation of dynamic scene reconstruction technology
- Goal: Reconstruction of animation models of humans in general apparel of unprecedented quality
  - In: multi-view video without markers
  - Out: detailed motion, shape and appearance

Recent Milestone Results
- High-detail facial performance capture using a single stereo camera [SIGGRAPH Asia 2012]
- Creating videos of humans performing user-designed motions [SIGGRAPH 2011]
- First method for performance capture of interacting people [CVPR 2011]
Video capture ubiquitous, but difficult.
Video editing difficult and requires skill.
Video exploration doesn’t exploit content, only metadata.

We exploit intra- and inter-video content relationships to ease video problems
- Automatic inpainting for editing [EUROGRAPHICS 2012, ECCV 2012].
- Video collection content relationship as a graph for explorations [SIGGRAPH 2012].
- Interactive viewpoint dynamic video scenes for explorations [CVMP2012].
Real world - Scene reconstruction

3D Capture: video + depth

Scene Representation

Rendering & Manipulation

Scene – EU Project

- Methods for video scene analysis of multi-view sequences
- Algorithms and data structures for scene representations
Advanced Ray Tracing and Data-Flow processing for the 3D-Internet
Philipp Slusallek

- XML3D Scene Description
  - Extending HTML-5 for 3D Graphics
- XFLOW Workflow Description
  - Animation, augmented reality, and image processing in real-time
  - Declare dataflows inside document
  - Automatic mapping to hardware
- New Progressive Global Illumination
  - Merging Photon Mapping and Monte-Carlo
  - SmallVCM: Data-parallel physically-based renderer w/ Vertex Merging & MC techniques
- Results
  - Interactive 3D in any browser (JS and WebGL)
  - Fast realistic lighting solutions
XML3D: 3D on the Web

Toyota Aygo visualisation

Visit other XML 3D projects
Conclusions

- Intel Visual Computing Institute
  - Project driven ICRI (Intel Collaborative Research Institute)

- This presentation focused on
  - Techniques for distributed rendering and displays
  - Content tools
  - Internet delivery

- Further resources
  - http://www.intel-vci.uni-saarland.de/