Rendering of photorealistic images in a Unix Network
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Contents
- The VERA Raytracer
- Computer animation with VERA
- The NetQ
- Presentation of animations
  - Oneness nan Novo
  - Illusion

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Rendering
- Photorealistic Rendering
- Raytracing
- Radiosity
- Non-Photorealistic Rendering (NPR)
- Image-Based Rendering (IBR)
- Computer Animation

Realistic Computer Animations around 1987
- Quest (Apollo Computers) 1987
- Luxo Junior (John Lasseter, Pixar) 1987
- Red's Dream (John Lasseter, Pixar) 1988
- Tin Toy (John Lasseter, Pixar) 1988
- Stanley and Stella in Breaking the Ice (Larry Malone, Symbolics) 1988
- Jumpin’ Jacques Splash (Georges Kular, Isabelle Foucher, Sogitec) 1988
- Eurythmy (Susan Amkreutz, Michael Girard) 1989
- Paris 1789 (Xavier Nicholas) 1989

The VERA Raytracer
- VERA = Very Efficient Raytracing Algorithm
- Development started in 1984 by Prof. Dr. Alfred Schmitt, Institut für Betriebs- und Dialogsysteme, Universität Karlsruhe
- Contributions by R. Lindner, M. Kadisch, M. Kim, O. Devillers, B. Dreyer, and others
- Integration in 1986 by Markus Linsenmann
- VERA-II: textures (R. Reichl)
- VERA-IV: space textures, copper plates, SIRDS, IBR module, ...
- (W. Leister, M. Linsenmann)
Sample objects used for modelling

The Lighting Model

Sample objects used for modelling

The Lighting Model
Distributed Computing of Computer Animations

- Where to get computing power from?
  - Many work stations on campus
  - These are not busy most of the time
    - SUN 3/50, SUN 3/60
  - Main Frame Machines (Siemens S7760, VAX)
- GRID Computing / Distributed Computing
- Example today: Seti@Home
- Apollo Quest
  - Node Hunter & Gigabyte Master !!!
- Matthew Merzenbacher, UCLA (centralised, fixed time periods)
- Mike Muuss, (chunks of scan lines (high overhead))
- Frank Heckbert, NYIT (decentralised disk space)
- John W. Petterson, Utah (heterogeneous network)
The NetQ

- GRID / Peer-to-Peer method
- Server
  - Export directory for control and payload data
- Client
  - Have installed netq program
  - Mount directory from server after idle time,
  - Calculate one image at a time
  - Uses kill -9 when work station is used interactively
  - All action initiated by client

Results

- 786576 frames, ca. 4000 rendered
- 9 GB, compressed 2.2 GB
- 70 MB / day
- ca. 1% of jobs bad (bugs in software, new infrastructure, user caused)
- Preview images 156x115 dithered

Results

<table>
<thead>
<tr>
<th>What</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>tasks (frame and preview)</td>
<td>64.51</td>
</tr>
<tr>
<td>finished</td>
<td>96.44</td>
</tr>
<tr>
<td>interrupted runs</td>
<td>3.56</td>
</tr>
<tr>
<td>cpu-hours (rendering)</td>
<td>2.81</td>
</tr>
<tr>
<td>cpu-hours (enqueuing)</td>
<td>0.36</td>
</tr>
<tr>
<td>actual number of machines</td>
<td>27 – 31</td>
</tr>
</tbody>
</table>

VERA-Animations at IBD Univ. Karlsruhe

- Ilusion
  - Work from 1988 to 1991
  - Entirely rendered with VERA raytracer
  - All rendered on SUN 3 and SUN 4 network at Universities in Karlsruhe and Freiburg
  - Video processing to analogue video disk
  - Sound: Synthesizer / Atari ST II
  - Design: Achim Stößer

VERA-Animations at IBD Univ. Karlsruhe

- Technologieregion Karlsruhe
  - Trailer for publicity film, 1991
- Universität Karlsruhe
  - Trailer for publicity film, 1991
- ZKM (Zentrum für Kunst- und Medientechnologie Karlsruhe)
  - Trailer for publicity film, 1991
- Several students work

VERA-Animations at IBD Univ. Karlsruhe

- occurrences anno Novo
  - Started early in 1987 after stipend from ORF / Ars Electronica
  - Entirely rendered with VERA raytracer
  - Mostly rendered on SUN 3 network
  - Some scenes on Siemens 57756, and VAX
  - 7750 frames, 24307 CPU-hours
  - Finished in September 1987,
  - Funding from Ars Electronica
  - Video processing: Data Images, Stuttgart
  - Sound: Synthesizer
  - Design: Achim Stößer

VERA-Animations at IBD Univ. Karlsruhe

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  - Trailer for publicity film, 1991
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VERA-Animations at IBD Univ. Karlsruhe

- End of the presentation

Thank you for your attention!