Blender in Research & Education

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Overview

• The RWTH Aachen University
  • The Computer Graphics Group
  • Research Projects

• Blender in Research
  • Modeling and scripting
  • Video editing

• Blender in Education
  • Modeling
  • Simulation
  • Rendering
RWTH Aachen University

• Facts
  • Founded 1870
  • About 27,000 students
  • About 7,000 personal
  • 410 professors

• Polytechnical University
  • 11 Computer Science Institutes
The Computer Graphics Group

- Head of department
  Prof. Dr. Leif Kobbelt
- Founded in 2000
- Main topics
  - Computer Graphics
  - Multimedia
- Website http://www.graphics.rwth-aachen.de/
Research Topics

• Geometry
• Computer Vision and 3D Reconstruction
• Image- and Video-Processing
• Global Illumination
• Physical and Medical Simulation
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Blender in Research

- Blender as a modelling tool
- Projects:
  - Radio Wave Propagation
  - Global Illumination
  - Character Animation

Blender in Research

• Blender as a modeller
  • Create scenarios for simulation or rendering
  • For character animation: Rigging and vertex weight painting

• More complex modeling tasks
  • Use proprietary software and algorithms
    • Remeshing
    • Mesh decimation
    • Mesh repair (making it 2-manifold, filling holes)
  • Using homegrown OpenMesh toolkit:
    • http://www.openmesh.org/
Blender in Research

- Radio Wave Propagation
  - Modeling of wireless and GSM networks
  - Blender: Geometry and material assignment

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Blender
  \arrow Scene model
  \arrow PhotonRT
  \arrow 3D intensity map
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Blender in Research

- Blender as a video sequencer
  - Supplemental material for conference submissions
  - Done either completely in Blender
  - Or captured with xvidcap and annotated in Blender
Blender in Research

- Blender scripting
- Easy to implement custom import filters
  - Modified OFF import with extra data
  - Import filter for Acclaim .asf skeleton files
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Blender in Education

- Why Blender?
  - Free (as in beer)
  - Free (as in speech)
- Pros
  - Promote usage of free software
  - Choice and variety is always good
  - Help students to get to know a complex 3D program for free
  - Students have access to sourcecode
Modeling

- Student project for 9th grade school-intern
  - Goal: Offer an interesting CG related task
  - Problem: No sufficient math background for theoretical work
  - Solution: Modeling a theater from blueprints!
    - Ca. 2.8 million faces
    - Textured and lit scene
Simulation

• Student project: Cloth simulation
  • Plugin/patch for Blender
  • Simulates cloth [1]
    • Mass spring model
    • Supports self collisions and collisions with objects
    • Mixed explicit/implicit integration model
  • For contact see our website and ask the students (Christian Ebke, Michael Kremer) [2]

Simulation
Simulation

[Image of a 3D rendering software interface showing a simulation of cloth simulation with adjusting parameters for weight, gravity, bending, stretching, speed, and deflection.]
Simulation
Renderers

- Global Illumination renderer called Photon
  - C++ (40k LoC)
  - Photon Mapping
  - Distributed Raytracer
  - Advanced Materials
  - OpenEXR output
- Download? Not yet, working on open-sourcing it . . .
Rendering
Rendering
Rendering

- Also supports lighting with environment maps
  (This image: HDR example lightprobe by Spheron Inc.)
Rendering
Conclusion

• What can education do for Blender?
  • Enlarge user-base
  • Enlarge visibility
  • Enlarge group of possible contributors
  • Enlarge importance in scientific community

• Advantages of Blender
  • Free software (as in freedom)
  • Free software (as in free beer)
  • Scripting abilities
  • Good and fairly easy to use video sequencer
Conclusion

• Disadvantages of Blender
  • Extending the core of Blender with C/C++ difficult for newbies (complex and ancient code)
  • Only basic mesh repair, decimation and remeshing capabilities
  • Video sequencer could use some additional basic features (e.g. fade to black/white, instead of workaround)