Seminar
Advanced Topics in Rendering

Matthias Teschner
Outline

– Introduction
– Organization
– Presentation
– Topics
– Summary
Computer Graphics

Modeling → Computer Graphics → Rendering

Simulation

CGI Making of Share a Coke VFX
Breakdown by ARMA
Graphics Courses

– Key course
  – Image processing and computer graphics (modeling, rendering, simulation)

– Specialization courses
  – Advanced computer graphics (global illumination)
  – Simulation in computer graphics (deformable and rigid solids, fluids)

– Master project, lab course, Master thesis
  – Simulation track, rendering track
## Seminars / Projects / Theses in Graphics

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<tr>
<th>Semester</th>
<th>Simulation Track</th>
<th>Rendering Track</th>
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<tr>
<td>Winter</td>
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<td>Summer</td>
<td>Key Course</td>
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<td>Lab Course - Simple fluid solver</td>
<td>Lab Course - Simple Ray Tracer</td>
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<td>Winter</td>
<td>Master Project - PPE fluid solver</td>
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<td>Summer</td>
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Outline

– Introduction
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– Topics
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Requirements

– Oral presentation of a rendering topic
  – English / German
  – Slides should be in English

– Written report
  – English / German
Goal

– Familiarize yourself with a topic
– Prepare a comprehensible presentation
– Presentation should be based on a scientific publication
  – Do not just reproduce the manuscript
  – Adapt the organization and the focus of the document in order to get a comprehensible presentation
Presentations

– Take place at the same time and in the same room as the introduction or per video conference
  – Announced in the course catalog and on our web page https://cg.informatik.uni-freiburg.de/teaching.htm
    – Advanced Topics in Rendering
    – Schedule

– Attendance is mandatory
Report and Submissions

– Written report (approx. 10 pages)
– Submission of presentation slides and written report in two separate PDF files
  – YourLastName_report.pdf
  – YourLastName_presentation.pdf
– Per email to Prof. Teschner
– Until the last day of lectures of the semester
Consultations

– Two voluntary consultations
– Requested per email
– First consultation
  – General discussion of the outline
  – Content questions
– Second consultation
  – Discussion of the fully prepared presentation
  – Not later than one week prior the presentation
Registration

- Check for available topics and dates
  - https://cg.informatik.uni-freiburg.de/teaching.htm
    - Advanced Topics in Rendering
    - Schedule
- Send an email to Prof. Teschner with your registration request stating name, topic, date
- Do not forget to register for the seminar in the campus management system
Outline

– Introduction
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Presentation

- 25 min – 35 min per presentation
- 10 min – 15 min discussion
  - Technical questions
  - Form of the presentation
Preparation

– Know your topic
  – Examine relevant material thoroughly
  – Do not try to circumvent problems

– Create slides
  – Allow 1 to 2 minutes per slide
  – Slides should be uniform and not too dense
  – Incorporate illustrations, slide titles should be helpful

– Rehearse your presentation
  – Gather feedback, adapt your presentation accordingly
Presentation

- Introduction
  - Introduce yourself and the title of your presentation
- Overview
  - Give an idea, but not too detailed
- Motivation
  - Illustrate the principle and / or applications
  - Explain the goal of your presentation
  - The audience should be eager to listen your presentation
Presentation

- Main part
  - Should be structured in sections
  - Separate different sections of the presentation explicitly
  - Each section should be introduced and summarized

- Summary
  - Tell the audience what you have told them
  - Ask for questions
Presentation

– Check the presentation environment prior to the presentation
– Avoid idiosyncrasies
– Stay in time
Outline

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Topics

– General concepts
– Rasterization
– Radiosity
– Ray tracing
– Related topics
General Concepts

- Human visual system / light modeling / radiometry
- Materials / shading models / BRDFs
- Rendering equation
- Monte Carlo integration
- Aliasing / Antialiasing
- Sampling / Reconstruction
Rasterization, Radiosity

- Rasterization
  - Topics, not covered in the key course
  - E.g. shadows
- Radiosity
  - Concept
Ray Tracing, Related Topics

- Ray tracing
  - Path tracing
  - Bidirectional methods, e.g. photon mapping
  - Volume ray tracing
- Related topics
  - Acceleration data structures
  - Dual Conturing, Marching Cubes
Sources

– Andrew Glassner
Principles of Digital Image Synthesis
http://www.realtimerendering.com/raytracing.html

– Matt Pharr, Wenzel Jakob, Greg Humphreys
Physically Based Rendering
http://www.pbr-book.org/
Sources

- Philip Dutre, Kavita Bala, Philippe Bekaert
  Advanced Global Illumination
  A K Peters

- Eric Haines, Thomas Akenine-Moeller
  Ray Tracing Gems
  Apress
Outline

– Introduction
– Organization
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Summary

- Oral presentation of 25-35 min
- Written report of 10 pages
- Topics overview and presentation dates
  - https://cg.informatik.uni-freiburg.de/teaching.htm
    - Advanced Topics in Rendering