Seminar
Advanced Topics in Rendering

Matthias Teschner

UNI FREIBURG
Outline

- Introduction
- Organization
- Presentation
- Topics
- Summary
Computer Graphics

Modeling

Simulation

Rendering

CGMeetup: CGI VFX Breakdown HD "Making of Share a Coke Vfx by ARMA" | CGMeetup. [Youtube]
Graphics Courses

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

- Specialization courses
  - Advanced computer graphics (global illumination)
  - Simulation in computer graphics (solids and fluids)

- B.Sc. / M.Sc. project, lab course, B.Sc. / M.Sc. thesis
  - Simulation track, rendering track
  - By appointment per email, semester-aligned
# Seminars / Projects / Theses in Graphics

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<th>Semester</th>
<th>Simulation Track</th>
<th>Rendering Track</th>
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<td>Summer</td>
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<td>Winter</td>
<td>Master Project - PPE fluid solver</td>
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Outline

– Introduction
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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 scientific publications
  - Do not just reproduce the material
  - Adapt the organization and the focus of the material in order to get a comprehensible presentation
Presentations

– Take place at the same time and in the same room as the introduction
  – 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

- Voluntary
- Requested per email
- General discussion of the outline
- Content questions
- 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](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, matriculation number
- Do not forget to check your registration in the campus management system
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Presentation

- 25 min – 35 min per presentation
- 10 min – 15 min discussion
  - Technical questions
  - Form of the presentation
- Example presentation and example report on our web page
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

- Results
  - Discuss capabilities, properties, benefits, drawbacks

- 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
References

Third-party material has to be labeled

Good

Good

Bad

[1] [Gissler et al. 2020]

Bibliography

- Examples

- General form
  - [...] Authors; Title of the material; Name of journal, conference, book, thesis, tutorial, web page, date.

- Wrong form
Presentation

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