Seminar
Advanced Topics in Rendering

Matthias Teschner

Outline

– Introduction

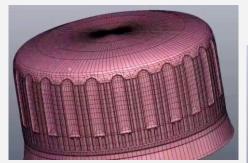– Organization

– Presentation

– Topics

– Summary

Computer Graphics

Modeling

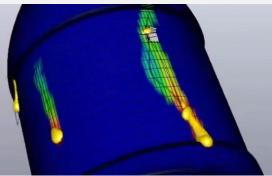Rendering

Simulation

Computer Graphics

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

Semester	Simulation Track	Rendering Track
Winter	Simulation Course	
Summer	Key Course Lab Course - Simple fluid solver Simulation Seminar	Key Course Lab Course - Simple Ray Tracer Rendering Seminar
Winter	Master Project - PPE fluid solver Rendering Seminar	Rendering Course Master Project - Monte Carlo RT Simulation Seminar
Summer	Master Thesis Research-oriented topic	Master Thesis Research-oriented topic

Outline

– Introduction
– Organization
– Presentation
– Topics
– Summary

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

    – 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

Outline

– Introduction

– Organization

– Presentation

– Topics

– Summary

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
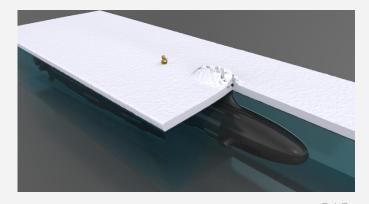 - The audience should be eager to listen your presentation

Presentation
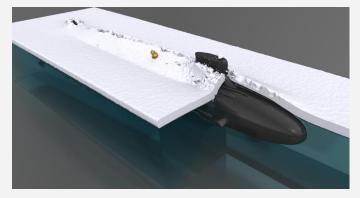
– Results
  – Discuss capabilities, properties, benefits, drawbacks
– Main part
  – Should be structured in sections
  – Separate different sections of the presentation explicitly
  – Each section should be introduced and summarized
– Summary
  – Tell the audience what you have told them
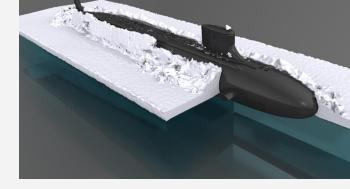 – Ask for questions

References

– Third-party material has to be labeled

Good

Good

Bad

[1]

[Gissler et al. 2020]

[C. Gissler, A. Henne, S. Band, A. Peer, M. Teschner, An Implicit Compressible SPH Solver for Snow Simulation, ACM Transactions on Graphics (Proc. SIGGRAPH 2020), vol. 39, no. 4, pp. 1-16, August 2020.]

Bibliography

– Examples

  – [1] C. Gissler, A. Henne, S. Band, A. Peer, M. Teschner, An Implicit Compressible SPH Solver for Snow Simulation, ACM Transactions on Graphics (Proc. SIGGRAPH 2020), vol. 39, no. 4, pp. 1-16, August 2020.

  – [Gissler et al. 2020] C. Gissler, A. Henne, S. Band, A. Peer, M. Teschner, "An Implicit Compressible SPH Solver for Snow Simulation", ACM TOG, 2020.

– General form

  – […] Authors; Title of the material; Name of journal, conference, book, thesis, tutorial, web page, date.

– Wrong form

  – [1] https://cg.informatik.uni-freiburg.de/publications/2020_SIGGRAPH_snow_v6.pdf

Presentation

– Check the presentation environment prior to the presentation

– Avoid idiosyncrasies

– Stay in time

Outline

– Introduction

– Organization

– Presentation

– Topics

– Summary

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

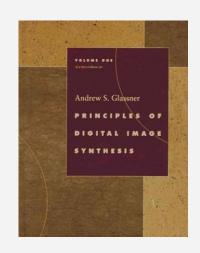– Sampling / Reconstruction

Rasterization, Radiosity

– Rasterization
  – Topics, not covered in the key course
  – E.g. shadows
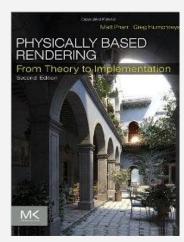– Radiosity
  – Concept

Ray Tracing, Related Topics

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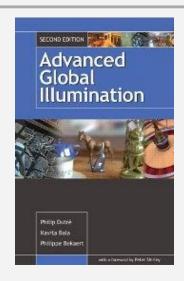 - Dual Conturing, (Marching Cubes)

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
https://link.springer.com/book/
10.1007/978-1-4842-4427-2

Outline

– Introduction

– Organization

– Presentation

– Topics

– Summary

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