Computer Graphics
Summary and Outlook

Matthias Teschner
Introduction to Computer Graphics

Rendering
Modeling
Simulation

Homogeneous Notation
Ray Casting
Bézier Curves
Particle Fluids

Rasterization
Piecewise Polynomial Curves
Phong
Rendering – Modeling – Simulation

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Modeling

Rendering
Rendering – Modeling – Simulation

Animation

Rendering

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Rendering – Modeling - Simulation

Johan Idoffsson
Chalmers University
Volvo Cars
Simulated and rendered with PreonLab
FIFTY2 Technology
Specialization Courses – Topics

**Rendering**
- Light: Radiometric Quantities
- Material: BRDF
- Light / Material: Rendering Equation
- Radiosity
- Stochastic Raytracing

**Simulation**
- Particle Motion
- Elastic Solids
- Fluids (Particles and Grids)
- Rigid Bodies
- Contact
# Specialization Courses – Concepts

| Rendering                            | Simulation                                      |
|--------------------------------------|-------------------------------------------------|
| Finite Element Modeling             | Finite Differences                              |
| Monte Carlo Integration              | Smoothed Particle Hydrodynamics                 |
| Linear Systems                       |                                                 |
| Spatial Data Structures              |                                                 |
| Real Time Graphics / High Performance Computing |                                                 |
Rendering Equation

- $L(p \rightarrow \omega_o) = L_e(p \rightarrow \omega_o) + \int_\Omega f_r(p, \omega_i \leftrightarrow \omega_o) L(p' \leftrightarrow \omega_i) \cos(\omega_i, n_p) d\omega_i$
- Establishes relations between incident and exitant radiances
- Expresses the steady state of radiances in a scene
- Governs the computation of radiances from all scene points into all directions

Akenine-Möller et al.
Solving the Rendering Equation

- Exitant radiances from all scene points into all directions

\[ L_e(p \rightarrow \omega_o) \]

\[ L(p \rightarrow \omega_o) \]
Particle Simulation
Projects – Theses

Rendering Track

Simple Raytracer

Stochastic Raytracer

Features / Performance / Accuracy

Simulation Track

Simple Fluid Solver

Incompressible SPH Solver

Research
Image Processing

- Slides, recordings, information on
  - https://lmb.informatik.uni-freiburg.de/lectures/image_processing/
- First question-and-answer session on
  - Monday, June 14, 10:15
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