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

Two technics to compute what is visible at the sensors

Phong

Phong: light, colors represent the light transport

Rendering – Modeling – Simulation

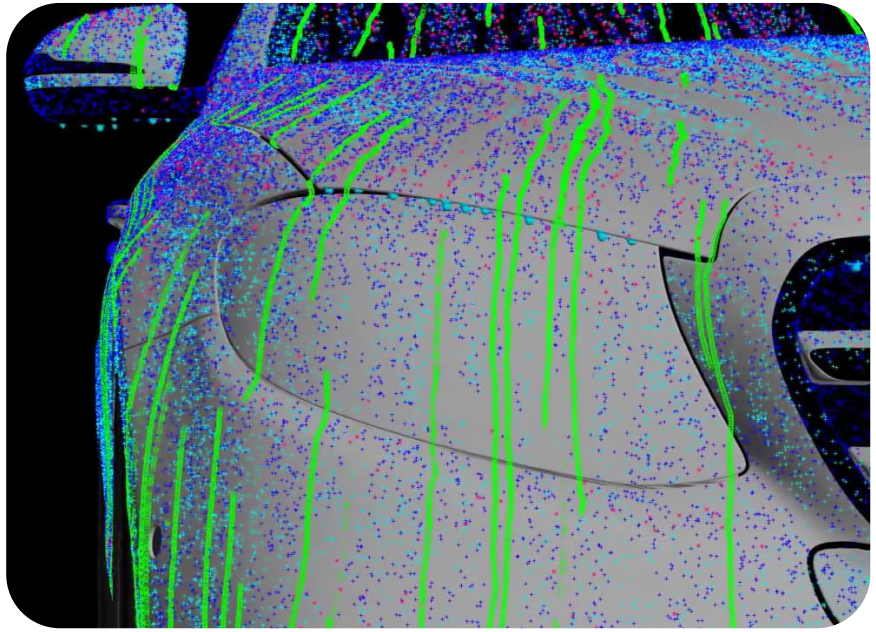
© Spellwork Pictures

Modeling

Rendering

Rendering – Modeling – Simulation

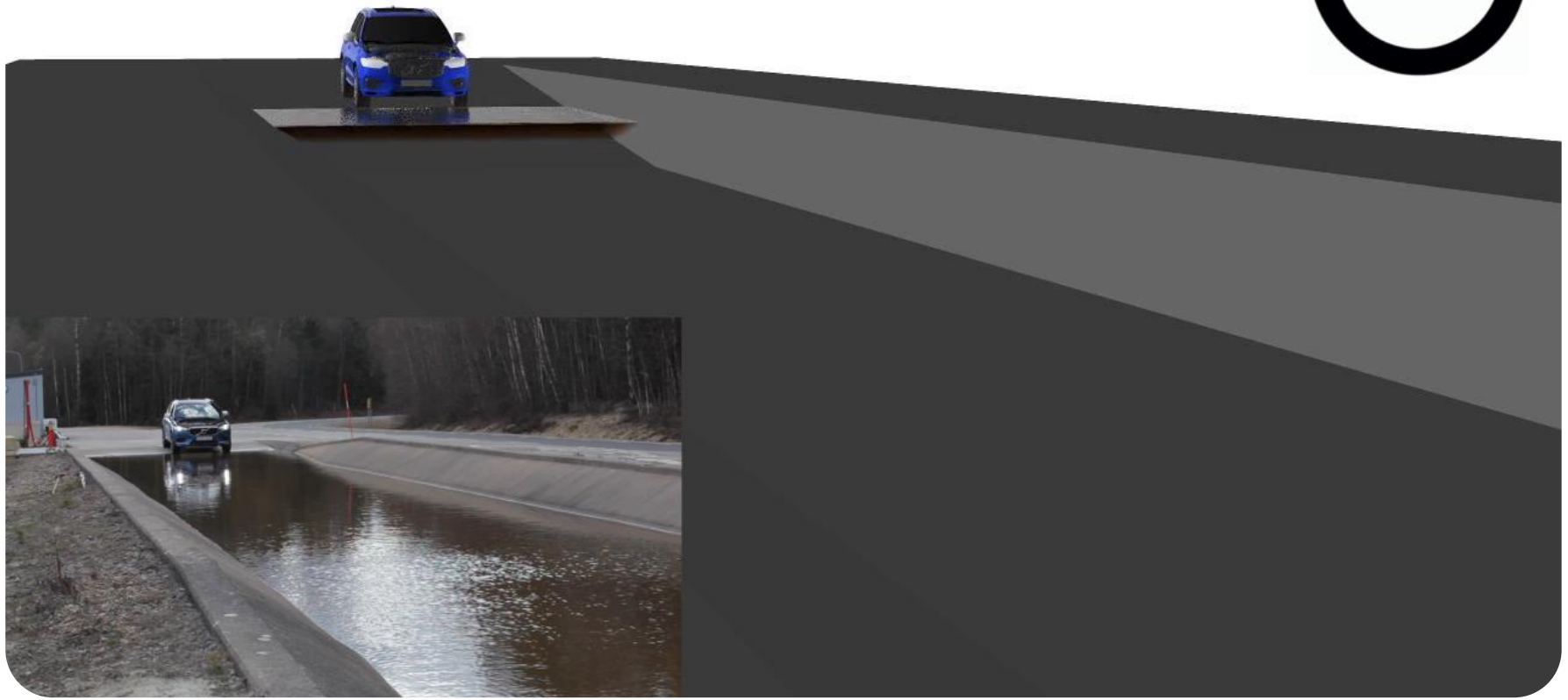
© Spellwork Pictures



Animation

Rendering

Rendering – Modeling - Simulation



Johan Idoffsson
Chalmers University

Volvo Cars

Simulated and rendered with
PreonLab
FIFTY2 Technology

Specialization Courses – Topics

Rendering	Simulation
Light: Radiometric Quantities	Particle Motion
Material: BRDF	Elastic Solids
Light / Material: Rendering Equation	Fluids (Particles and Grids)
Radiosity	Rigid Bodies
Stochastic Raytracing	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

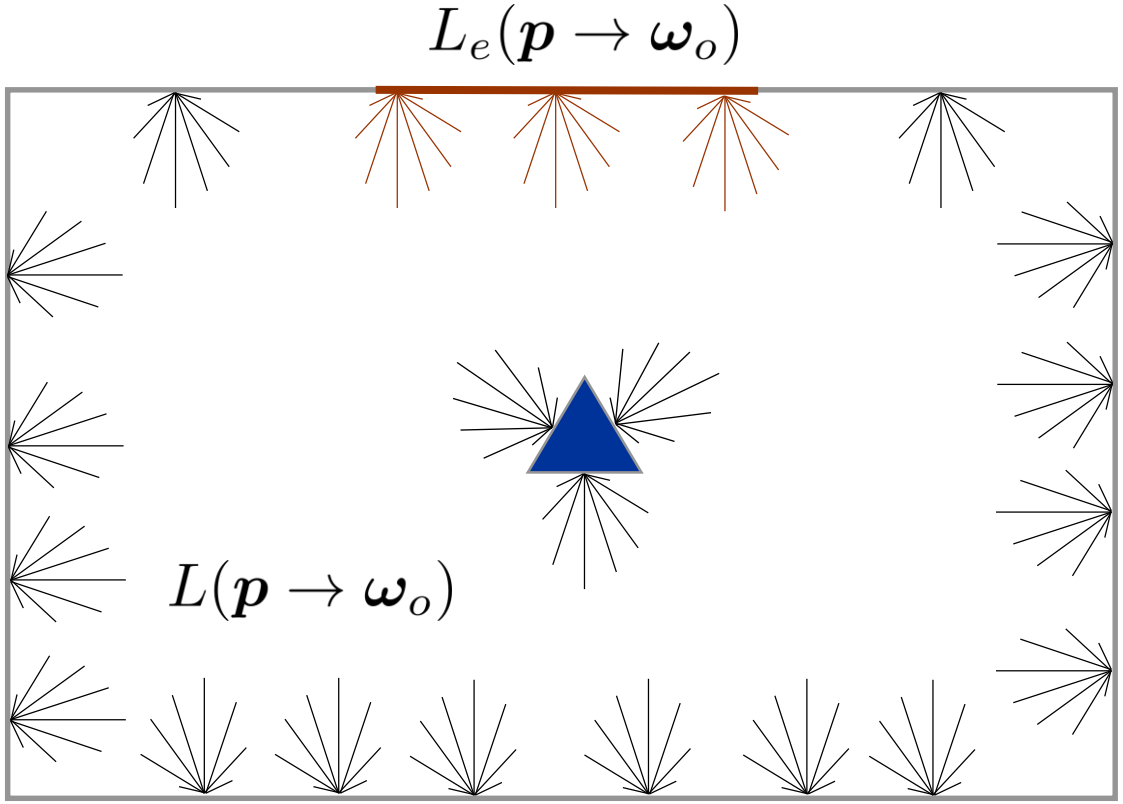
Rendering Equation

- $L(\boldsymbol{p} \rightarrow \boldsymbol{\omega}_o) = L_e(\boldsymbol{p} \rightarrow \boldsymbol{\omega}_o) + \int_\Omega f_r(\boldsymbol{p}, \boldsymbol{\omega}_i \leftrightarrow \boldsymbol{\omega}_o) L(\boldsymbol{p}' \leftarrow \boldsymbol{\omega}_i) \cos(\boldsymbol{\omega}_i, \boldsymbol{n}_p) \mathrm{d}\omega_i$
- 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.

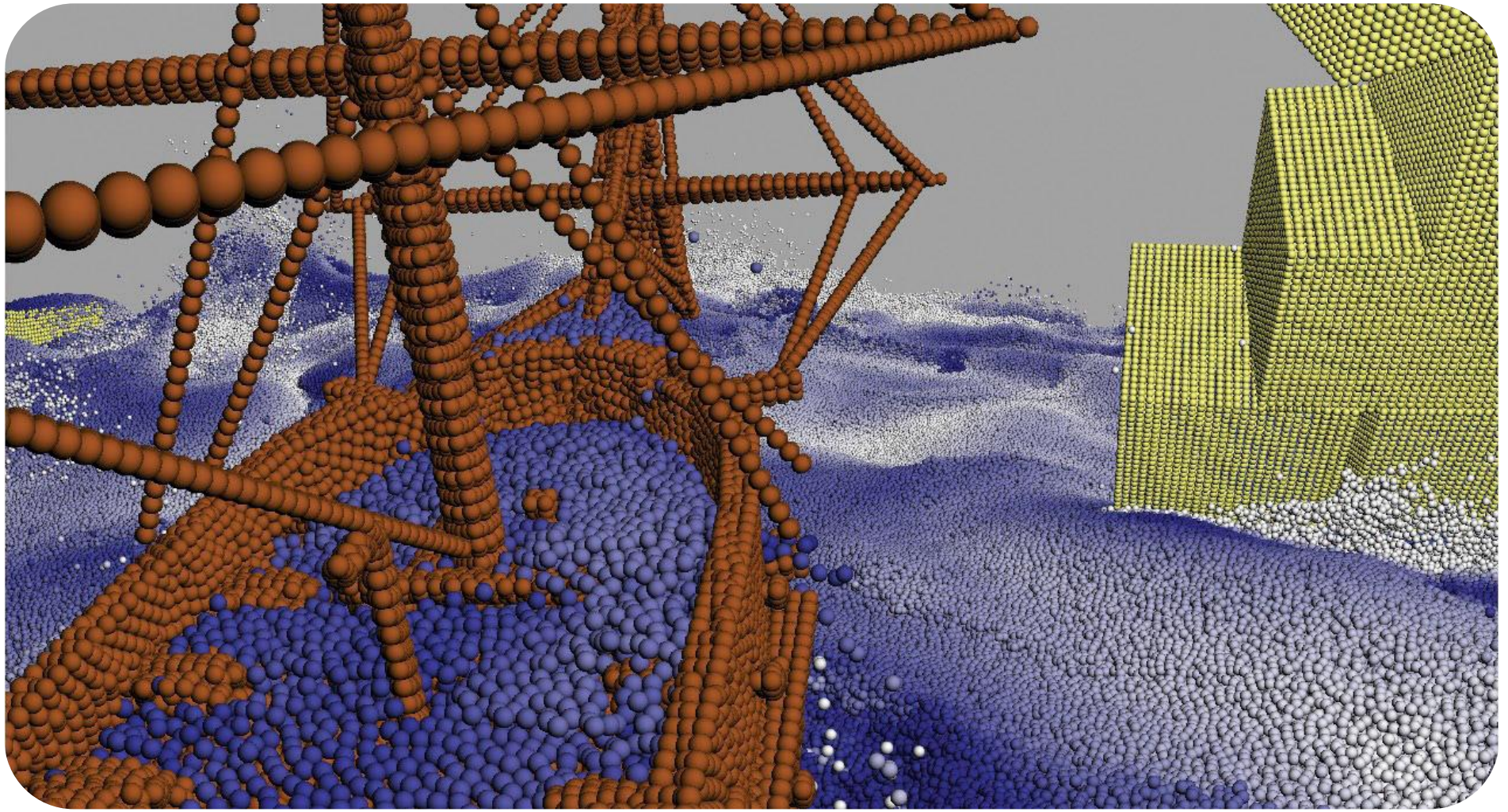
Solving the Rendering Equation

– Exitant radiances from all scene points into all directions



Cornell box

Particle Simulation



Projects – Theses

Rendering Track	Simulation Track
Simple Raytracer	Simple Fluid Solver
Stochastic Raytracer	Incompressible SPH Solver
Features / Performance / Accuracy	
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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