Computer Graphics

- A Primer on Rendering -

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(many slides inspired by Prof. Wenzel Jakob)
What is Rendering?

Computer Graphics

Modelling
How to build a digital representation of a 3D scene?

Animation
How to bring a 3D scene to life?

Rendering
How can we generate an image from a digital representation of a 3D scene?
What is Rendering?

Computer Graphics

Modelling
- Surface representations
- Texturing
- Shape modelling algorithms
- Shape modelling interfaces

Animation
- Keyframe animation
- Physics-based animation
- Simulations
- Motion Capture

Rendering
- Realtime rendering
- Shaders
- Rasterization
- Surface reflection

Physically-Based Rendering
- Light transport
- Material models
- Volumetric scattering
- Monte Carlo simulation
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This Course

Realistic Image Synthesis
Light transport in real life

After [Ritschel et. al 2011]
Light transport in real life

Caustics
Light transport in real life

Subsurface Scattering
Light transport in real life

Participating Mediums (Volumetric Rendering)
Material models

A diffuse surface

A conductor

A dielectric
Material models

An almost specular surface

A rough surface

A multi-layered material
Rendering a scene

3D Scene Representation  ?  Rendered Scene
Rendering a scene

Light to Camera vs Camera to Light (Helmholtz Reciprocity)
Rendering a scene

Rendering Engine \textit{(What you will build!)}

\begin{itemize}
  \item Write
  \item Camera
  \item Integrator \quad \int_{S^2} \cdots \, d\omega
  \item Samples
  \item Intersections
  \item Geometry
  \item Materials
\end{itemize}
Rendering a scene

Rendering Engine *(What you will build!)*

- Write
- Camera
- Rays
- $\int_{S^2} \cdots d\omega$
- Integrator
- Samples
- Intersections
- Materials
- Geometry

Light Transport Simulation
PDF content
Questions?