OS1-2

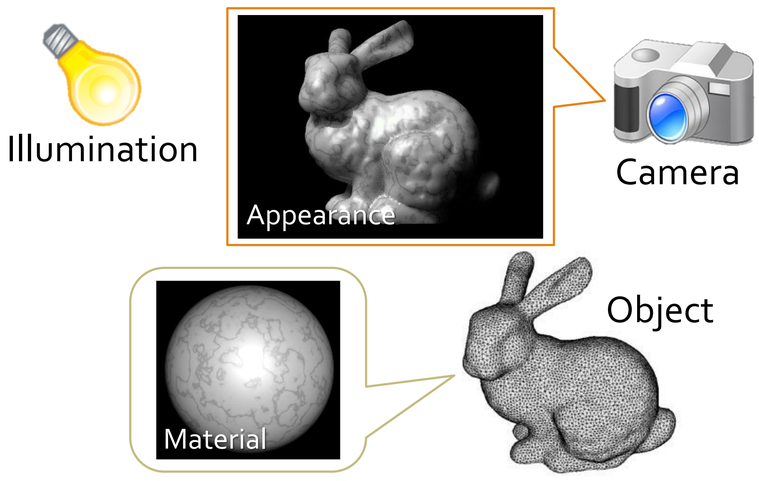
Full-dimensional Sampling and Analysis of BSSRDF

Chika Inoshita, Seiichi Tagawa, MD. Abdul Mannan, Yasuhiro Mukaigawa, Yasushi Yagi
ISIR, Osaka University

Background

◆ Material vs. appearance

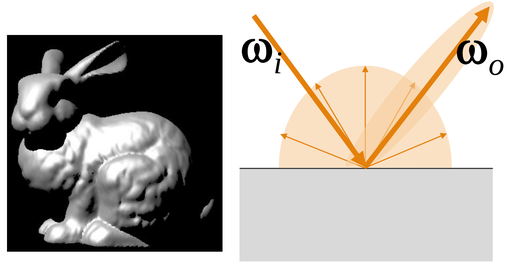
• Scene appearance changes by material



Purpose

◆ Analysis of light interaction

Surface reflection

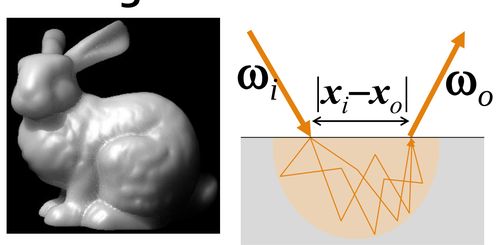


4D $f(\omega_i, \omega_o)$

Well studied as BRDF

(BRDF: Bidirectional Reflection Distribution Function)

Scattering in homogeneous media

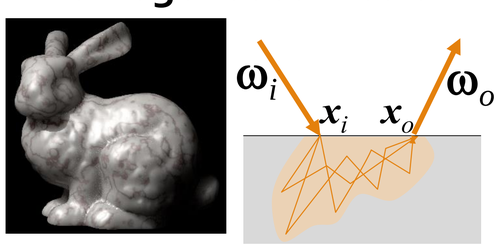


5D $f(\omega_i, \omega_o, |x_i - x_o|)$

Well studied in the field of Computer graphics

Most difficult to sample and analyze

Scattering in inhomogeneous media



8D $f(x_i, \omega_i, x_o, \omega_o)$

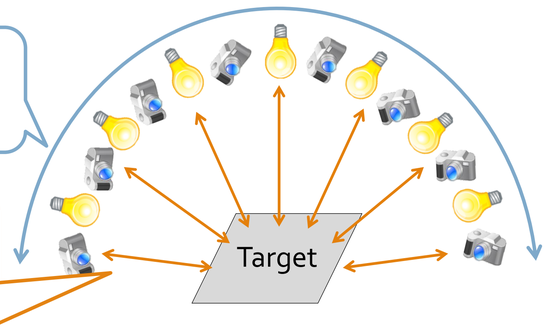
Not studied as BSSRDF

(BSSRDF: Bidirectional Scattering Surface Reflection Distribution Function)

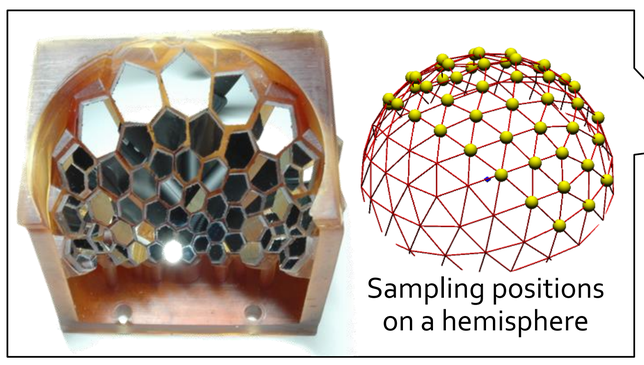
Sampling

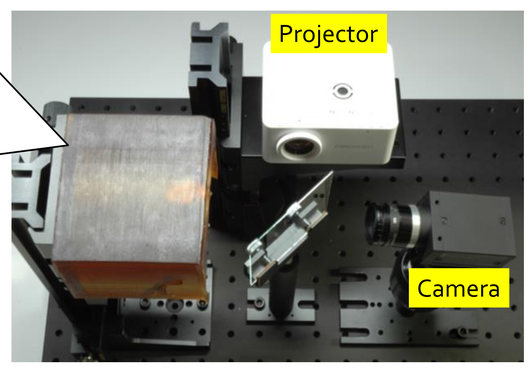
◆ Requirements

1. Surround target object with a lot of cameras and projectors
2. Distribute cameras and projectors with uniform density at a constant distance



◆ Solution: ***Turtleback reflector*** [Tagawa et al. MIRU2010]





System overview

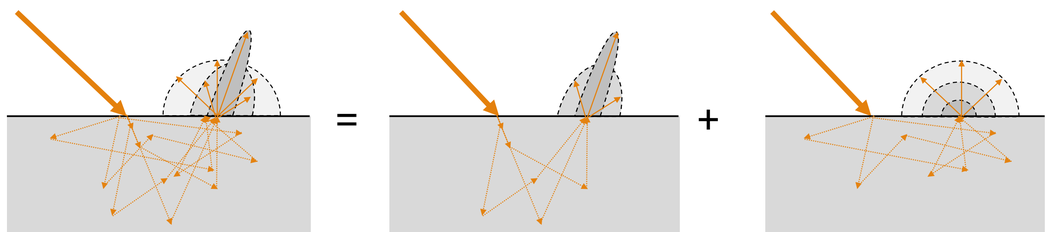
◆ Sampling resolution

- Direction of incident and outgoing lights ω_i, ω_o: 48
- Position of incident light x_i: 20 x 20
- Position of outgoing light x_o: 100 x 100 *Total: 9.216 x 10^9*

BSSRDF decomposition

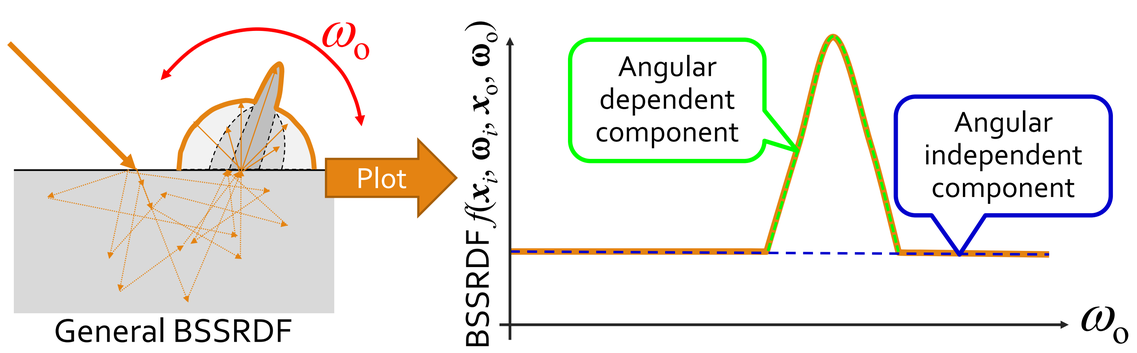
◆ Principle

- General BSSRDF is consisted of angular dependent and angular independent components



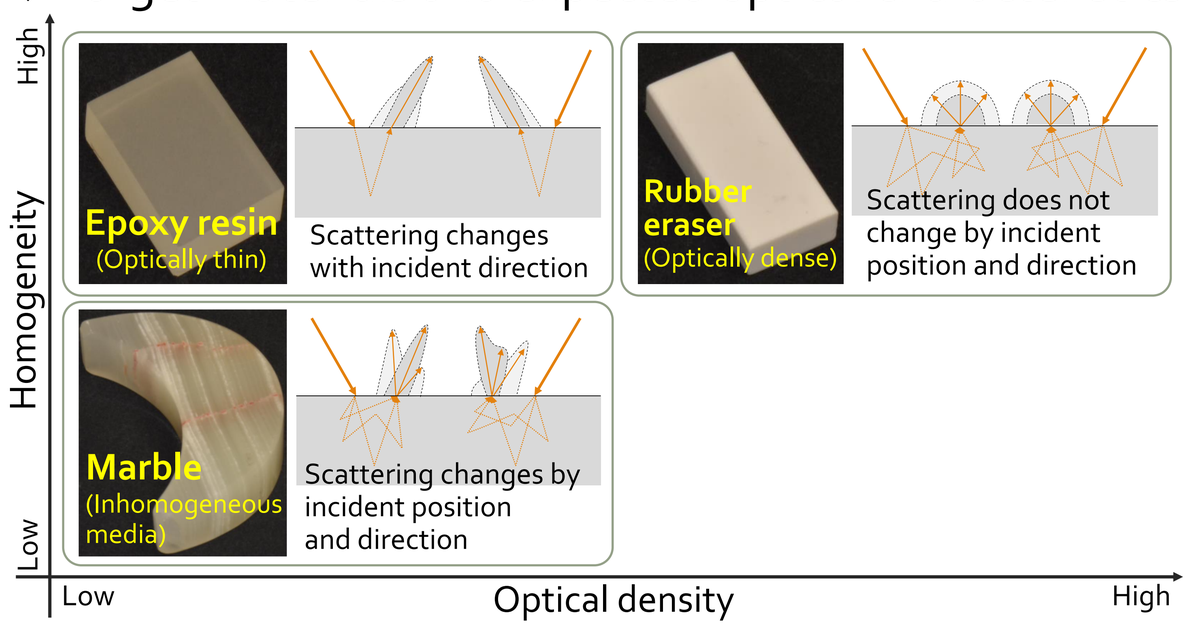
◆ Decomposition algorithms

- Focusing on variation of BSSRDF along with outgoing direction



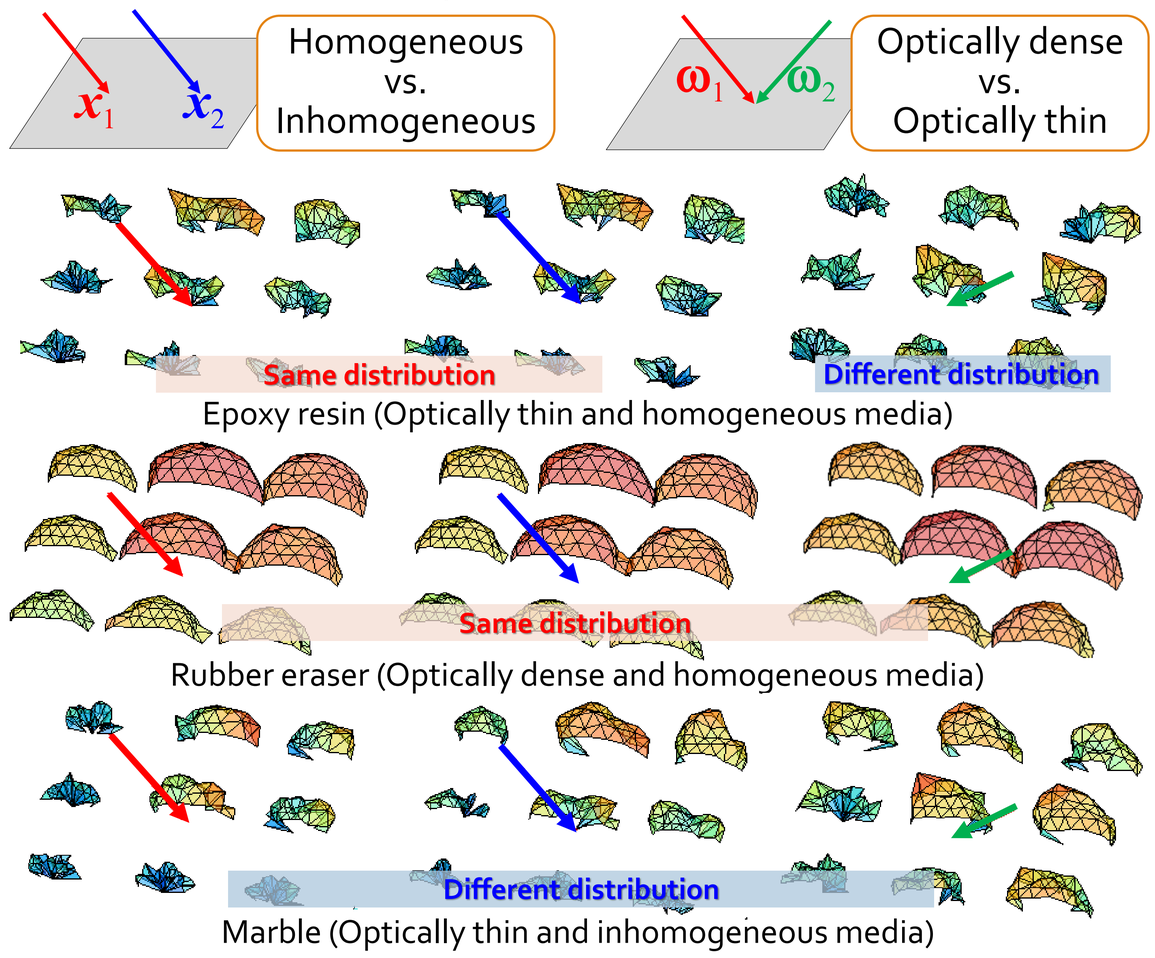
Analysis of sampled BSSRDF

◆ Target materials and expected optical characteristics



◆ Visualizing 4D slices $f(x_o, \omega_o)$ of BSSRDF

1. With fixed incident direction ω_i
2. With fixed incident position x_i



◆ BSSRDF decomposition