Tutorial

Bidirectional Texture Functions Modelling

Introduction

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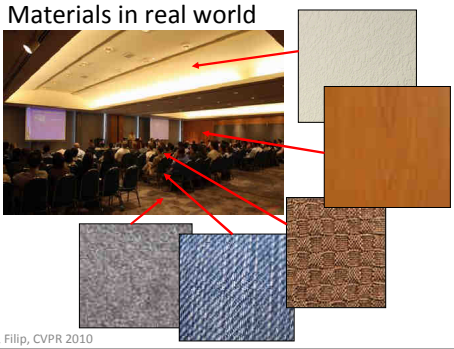
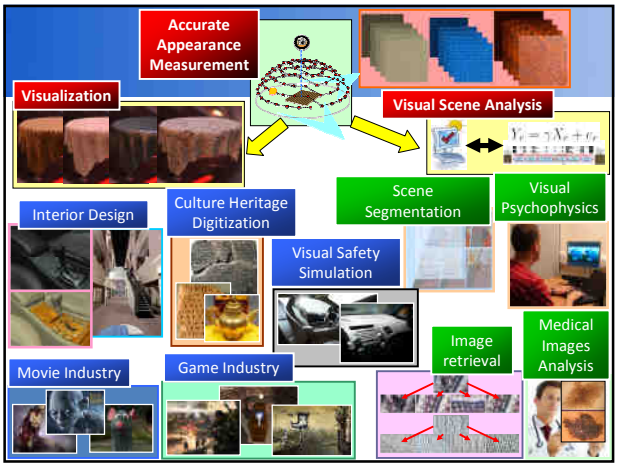
Motivation

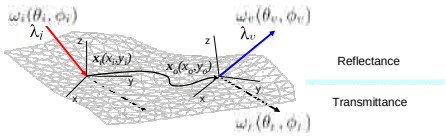
- Materials in real world



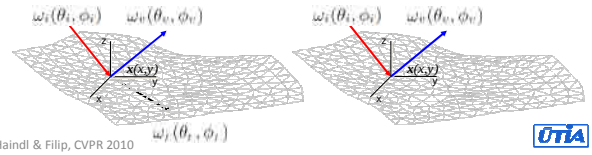


Light-Material Interaction

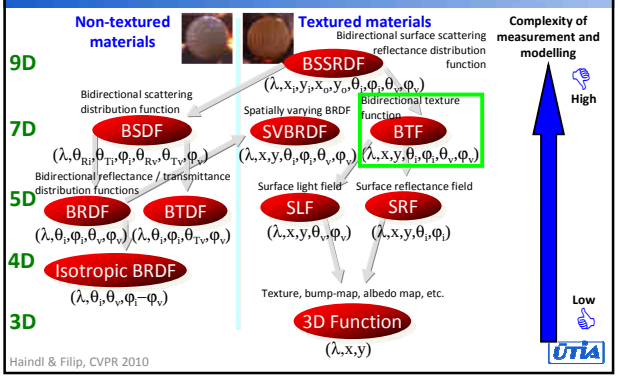
General model of light-material interaction



Without sub-surface scattering Opaque materials



Taxonomy of Material Appearance Representations



BRDF

- Illumination and view dependent reflectance

- Helmholtz reciprocity

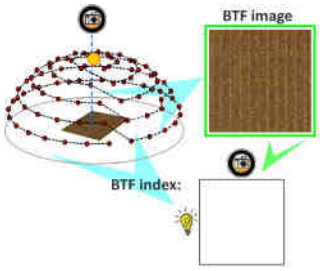
$$BRDF(\lambda,\theta_i,\varphi_i,\theta_v,\varphi_v) = BRDF(\lambda,\theta_v,\varphi_v,\theta_i,\varphi_i)$$

- Energy conservation

$$\int_\Omega BRDF(\lambda,\theta_i,\varphi_i,\theta_v,\varphi_v)\cos\theta_v d\omega_v \leq 1$$

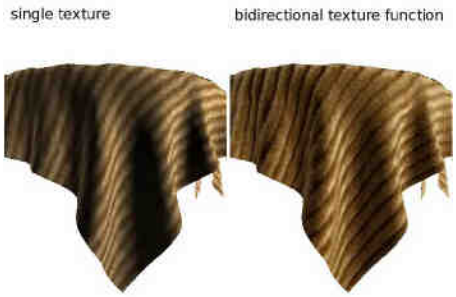
Bidirectional Texture Function

- One of the best representations of textured materials appearance
- **Massive** data (GBs)
  - difficult direct application



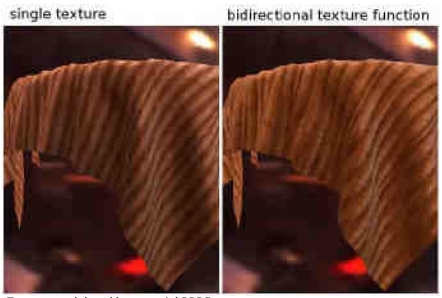
Includes: inter-reflections, sub-surface scattering, local masking and shadowing

Bidirectional Texture Function



Texture modulated by material BRDF

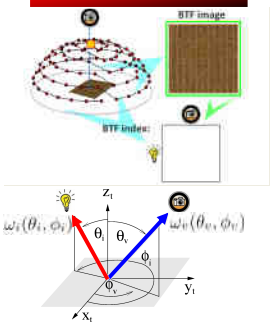
Bidirectional Texture Function



Texture modulated by material BRDF

Bidirectional Texture Function

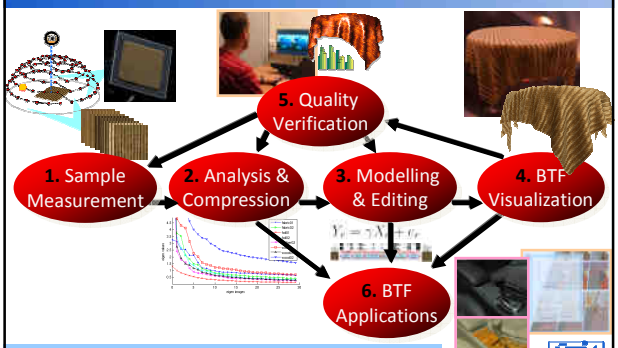
Material measurement → Material Visualization



$$BTF(\lambda, r_1, r_2, \theta_i, \varphi_i, \theta_v, \varphi_v)$$

Spectral Spatial Illumination & view direction dependency

Tutorial Outline



Recent survey [Filip&Haindl, IEEE TPAMI 2009]

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- Jiří Grim
- Martin Hatka
- Vojtěch Havlíček
- Radek Holub
- Stanislav Mikeš
- Petr Somol
- Pavel Vácha

Tutorial slides:
http://staff.utia.cz/filip/BTF2010.zip