A Data-Driven Reflectance Model

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Bidirectional Reflectance Distribution Functions (BRDF)

- Models how light reacts to a surface
  - Outogin and incident light directions
  - Light properties
  - Material properties
  - Geometric profile
Figure 3: The standard coordinate frame is shown on the left. Rusinkiewicz’s coordinate system is shown on the right.

Phong BRDF
A barren field with rough surface. Left: backscattering (sun behind observer), note the bright region (hotspot) where all shadows are hidden. Right: forwards scattering (sun opposite observer), note the specular reflection. Photograph by Don Deering.
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The paper: “A data-driven reflectance model”

- Acquire dense set of data
  - Index into this table
- Use lots of materials
Doesn’t work on

– Models with subsurface scattering
  • (skin, glass, water)
– Anisotropy (cd, christmas ornament)
– Non-homogeneous materials

Isotropic
Homogeneous
Transparent

http://hawk.ise.chuo-u.ac.jp/makino/CG/mirage/
Capturing BRDF

Figure 2: A photograph of our high-speed BRDF measurement gantry.

Figure 4: Two log images of a sphere (alumina oxide). A real image is shown on the left. A synthesized image using tabulated BRDF data is shown on the right.
Making Novel materials

- User Interface with 16 different traits
  - Redness
  - Greenness
  - Blueness
  - Specularness
  - Diffuseness
  - Glossiness
  - Metallic-like
  - Plastic-like
  - Roughness
  - Silverness
  - Gold-like
  - Fabric-like
  - Acrylic-like
  - Greasiness
  - Duesiness
  - Rubber-like

Figure 6: Rendered teapots using BRDFs from our database: nickel, hematite, gold paint, and pink fabric.
Increase Glossiness applied to YellowDiffusePaint BRDF
More information

Slide Credits

• Images from
  - geography.bu.edu/brdf/brdfexpl.html