Equipe Associée – Associated Group

CRISP

Creating, Rendering and Interacting with images based on the Study of Perception

(note: unpublished projects presented at workshop have been removed from these slides)
The People

- UC Berkeley:
  - Maneesh Agrawala (Computer Science/Graphics & Interaction)
  - Ravi Ramamoorthi (Computer Science/Graphics)
  - Marty Banks (Vision Science)

- INRIA (REVES Inria Sophia-Antipolis Méditérranée)
  - George Drettakis (Graphics)
  - Adrien Bousseau (Graphics) – past postdoc at UCB

- 4-6 Ph.D. students and 2-3 Postdocs potentially involved
Realistic and Expressive Rendering
Materials in Computer Graphics
Lighting and Shadows
Main Objectives

• Create, render and interact based on the study of human perception

• Research directions:
  – Perception: how do people perceive images, both realistic and “expressive”?
  – Rendering: plausible \textit{wrt} to user intent & allocate resources on perceptually important visual effects
  – Interaction: Facilitate content creation via novel user interfaces for novice and professional users.
Scientific goals

• Interpreting images

• Creating and manipulating images

• Rendering images
Scientific Goals: Interpreting images

• Study how people perceive lighting, material and geometry in an image
• Important both for drawings and illustrations and for rendering
• Allow the development of novel drawing interfaces and efficient rendering algorithms
Interpreting Images

- Perception and illustration of materials

![Glossy plastic](image)
![Glass](image)
![Chrome](image)
Scientific Goals: Creating and manipulating images

• Complex interactions between *geometry*, *material* and *lighting* parameters result in interfaces that are hard-to-use
• Identify which image components are perceptually important
• Propose novel interaction paradigms and image creation/manipulation algorithms based on these results
Interfaces for Content Creation
Scientific Goals: Rendering Images

• Identify which approximations users tolerate well
• Develop new, more efficient algorithms exploiting perceptually “appropriate” approximations
• Enhance the depiction of geometry, materials and lighting without degrading quality
Rendering images

- Which approximation is more tolerable?
Talk Overview

• Projects in progress
• Future projects
• Conclusions
Ongoing Projects

• Interpreting images:
  – Perception of materials with stereo and parallax
  – Perception of materials in “expressive” renderings

• Creating and manipulating images:
  – Lighting design for material depiction

• Perception:
  – Crowdsourcing for perceptual studies
Lighting Design for Material Depiction

Adrien Bousseau, Emmanuelle Chapoulié
REVES – INRIA Sophia Antipolis

Ravi Ramamoorthi, Maneesh Agrawala
UC Berkeley

To be presented at Eurographics Symposium on Rendering 2011
Lighting affects material appearance

Our optimized lighting emphasizes materials

Poor lighting de-emphasizes materials
Lighting design principles

**Transparent (glass, ice)**
High contrast at contours

**Subsurface scattering (wax, marble, organic)**
Thin parts brighter

**Asperity (velvet, fur)**
High contrast highlights at grazing angle

**Shiny (metal, plastic, chrome)**
High contrast edges in reflections

**Fresnel (glass, plastic, varnish)**
High contrast reflections at grazing angle
**Optimal lighting**

**Transparent (glass, ice)**
High contrast at contours

**Subsurface scattering (wax, marble, organic)**
Thin parts brighter

**Asperity (velvet, fur)**
High contrast highlights at grazing angle

**Shiny (metal, plastic, chrome)**
High contrast edges in reflections

**Fresnel (glass, plastic, varnish)**
High contrast reflections at grazing angle
Best orientation of real lighting
**Best orientation of real lighting**

- **Transparent (glass, ice)**
  High contrast at contours

- **Subsurface scattering (wax, marble, organic)**
  Thin parts brighter

- **Asperity (velvet, fur)**
  High contrast highlights at grazing angle

- **Shiny (metal, plastic, chrome)**
  High contrast edges in reflections

- **Fresnel (glass, plastic, varnish)**
  High contrast reflections at grazing angle
Worst orientation of real lighting

**Transparent (glass, ice)**
High contrast at contours

**Subsurface scattering (wax, marble, organic)**
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High contrast reflections at grazing angle
Conclusions

• General orientations
  – Perception-oriented studies which advance understanding: true multidisciplinary research
  – Advance research in graphics, (human) vision and human-computer interaction
  – Develop new algorithms for rendering and interaction, capitalize on perceptual studies