

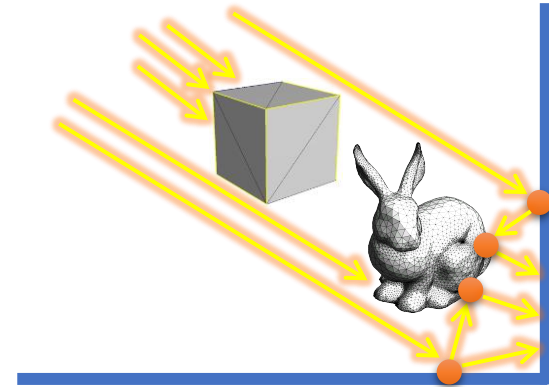
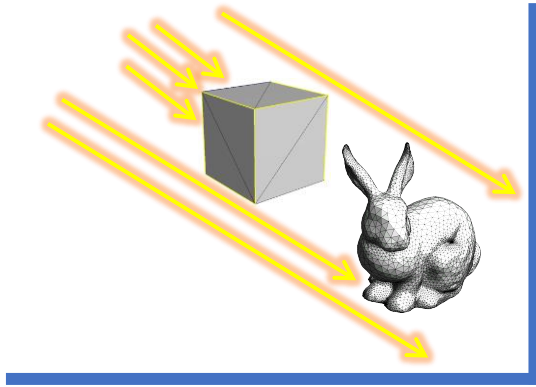


Global Illumination

Computer Graphics

Yu-Ting Wu

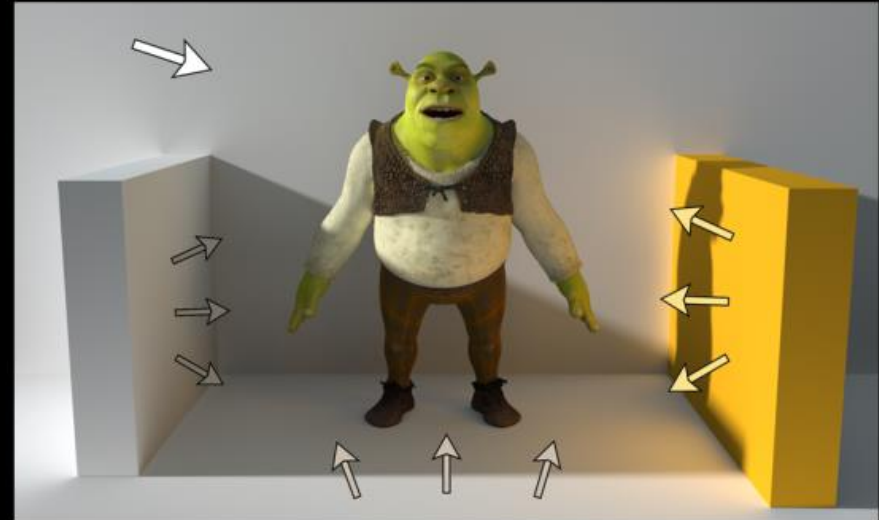
Global Illumination



Direct Lighting Only



Direct + Indirect Lighting



Global Illumination (cont.)

global illumination =

direct illumination

+

indirect illumination

↓
local illumination + shadow map

↓
difficult

constant ambient term

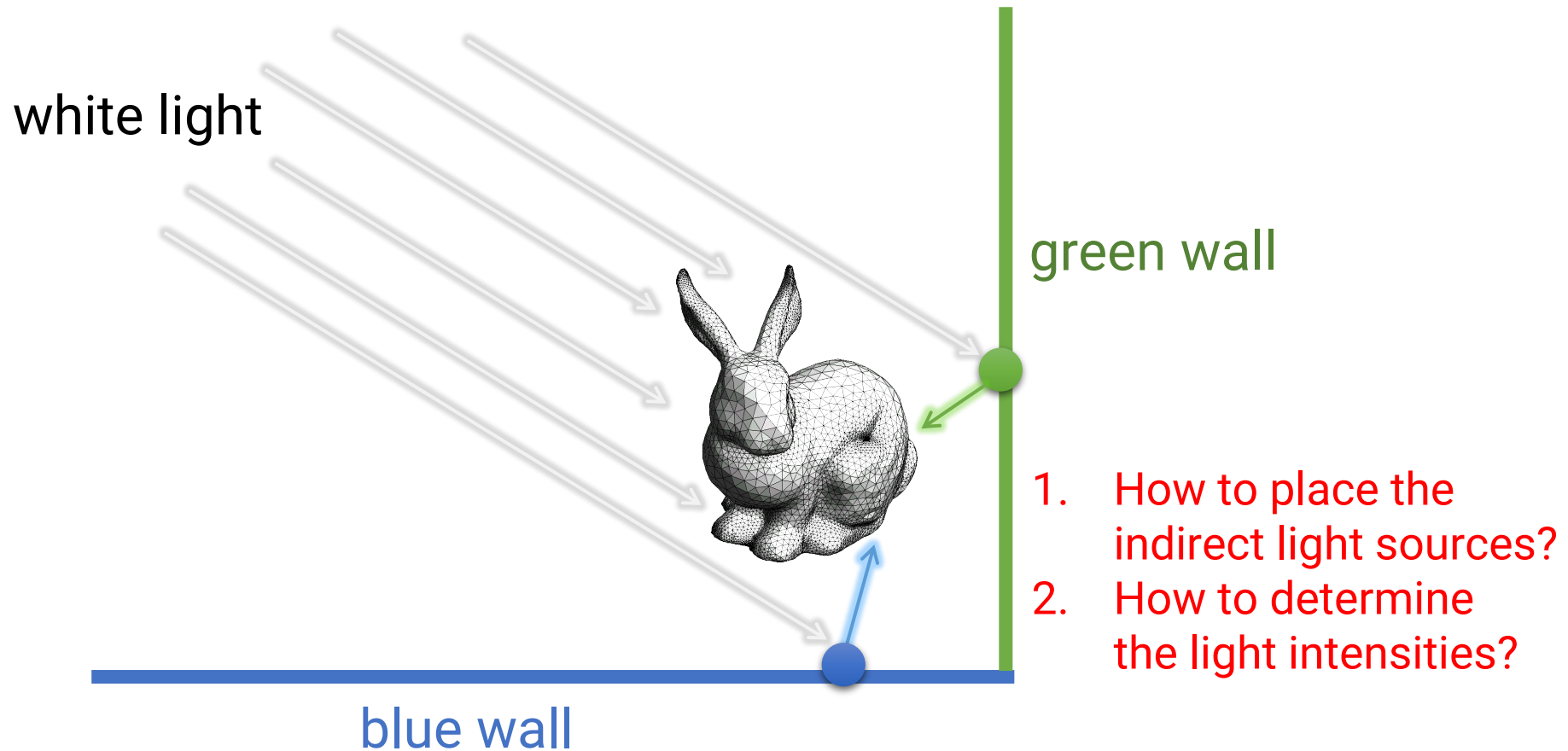
+ ambient occlusion

not good enough

Global Illumination (cont.)



Global Illumination (cont.)

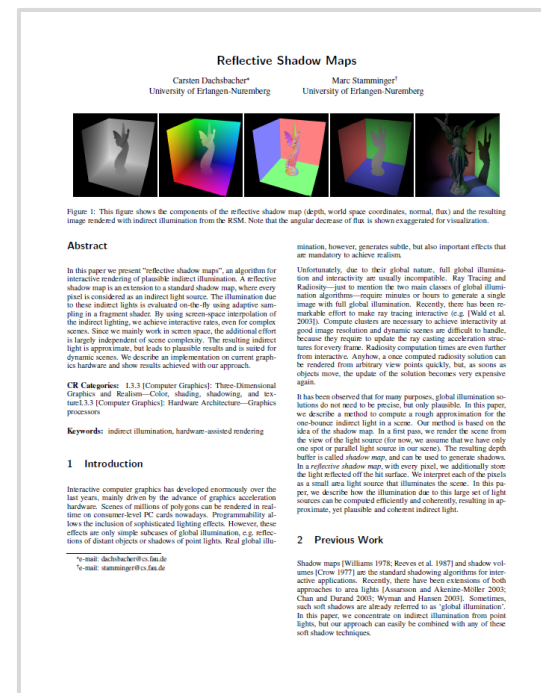


Global Illumination (cont.)

- Indirect illumination is especially difficult for rasterization because ...
 - **Each polygon only has its own information**
 - **It does not know which triangle will cast lighting on it**
- In the last two decades, hundreds of research papers focus on this topic to approximate visually-pleasing global illumination in real-time

Reflective Shadow Map

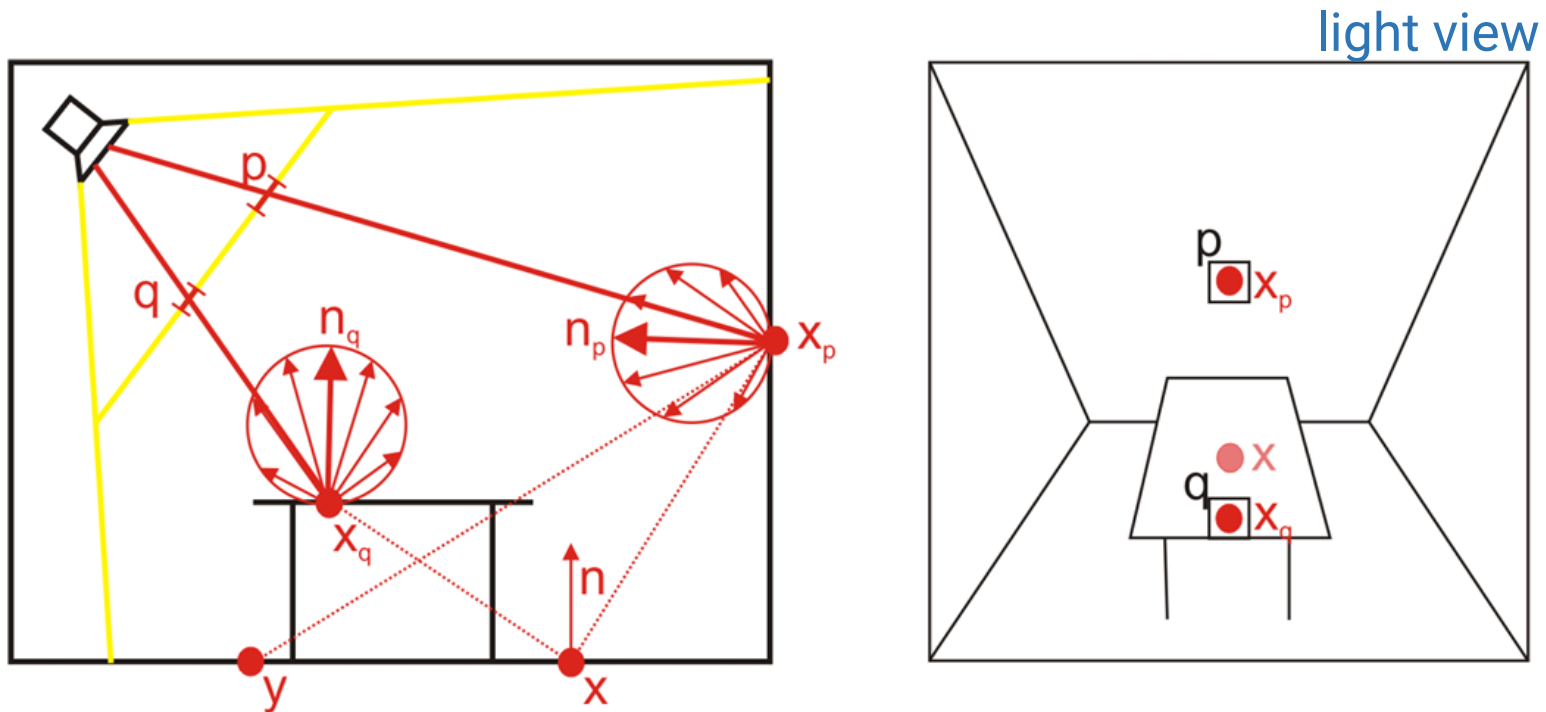
- Proposed by Dachsbacher and Stamminger, I3D 2005
- A classic real-time solution for indirect lighting
- Extend the idea of shadow mapping



Reflective Shadow Map (cont.)

- **Major idea**

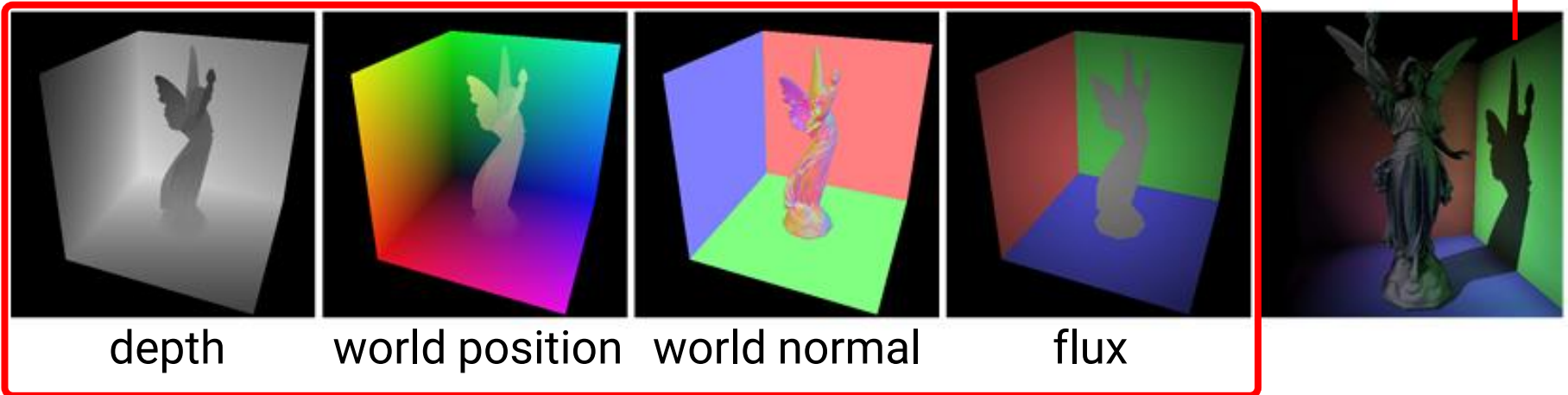
- The closest surfaces from the light can receive the lighting contribution
- They become the indirect light sources



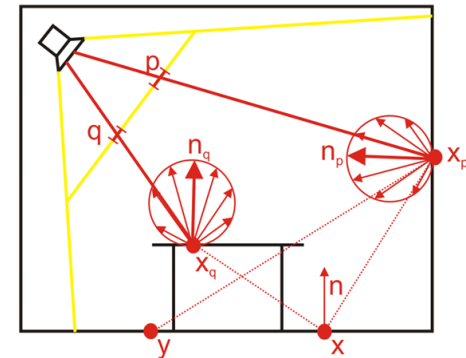
Reflective Shadow Map (cont.)

- Two-pass rendering algorithm

Pass II: render from the camera view



**Pass I: render G-buffer from a light view
(called RSM)**

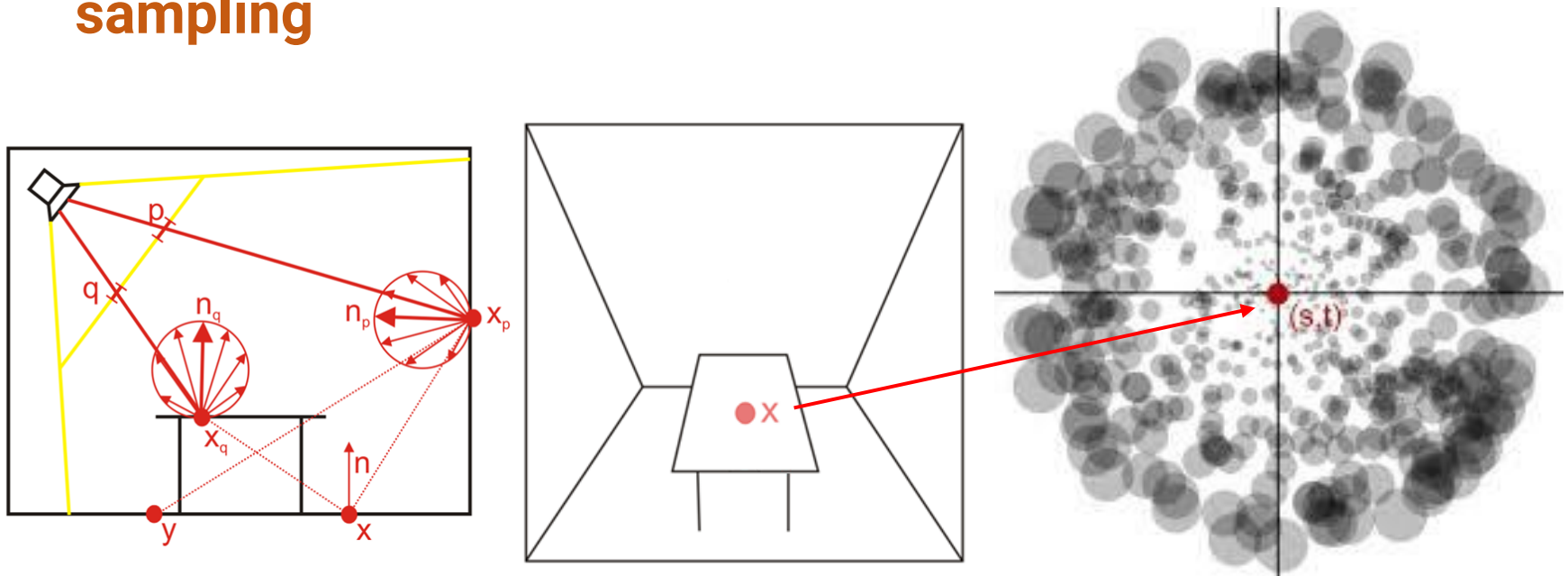


Reflective Shadow Map (cont.)

- **Pass I:** rendering G-buffer (called **RSM**) from the light view for generating indirect light sources
 - World-space position
 - World-space normal
 - Reflected flux
 - The intensity of the primary light source multiplied by the reflectance of the surface
- **Pass II:** rendering from the camera view
 - Direct lighting is computed by local illumination and shadow mapping
 - Indirect lighting is estimated from the RSM

Reflective Shadow Map (cont.)

- Every pixel in the RSM represents an indirect light source
- If the resolution of RSM is 256 by 256, we got 65536 indirect light sources
- We can not afford to compute lighting from all pixels:
sampling



Reflective Shadow Map (cont.)

