

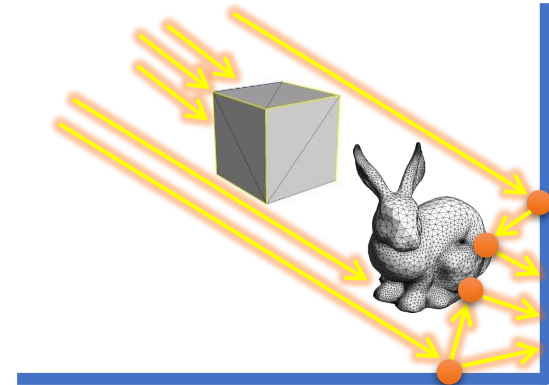
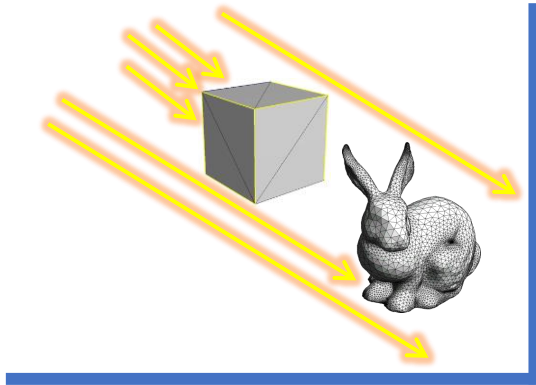


# Global Illumination

**Introduction to Computer Graphics**

**Yu-Ting Wu**

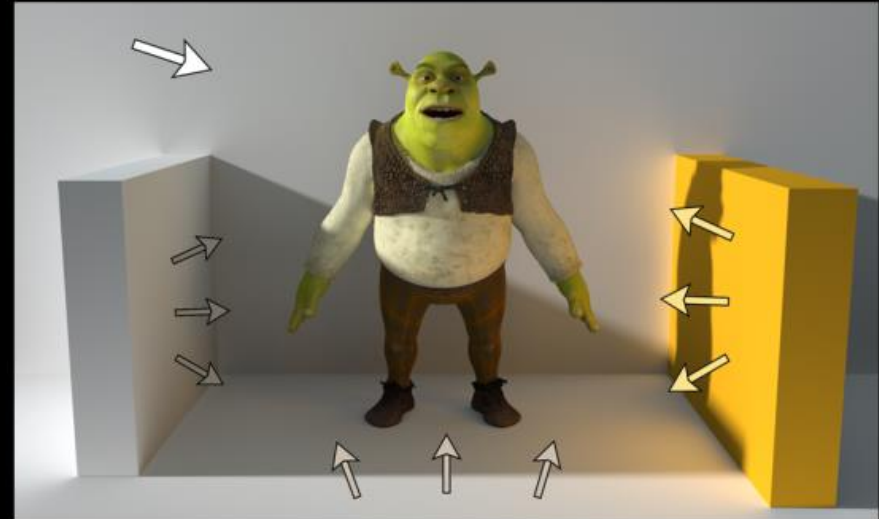
# Global Illumination



Direct Lighting Only



Direct + Indirect Lighting



# Global Illumination (cont.)

global illumination =

direct illumination

+

indirect illumination



local illumination + shadow map



**difficult**

constant ambient term

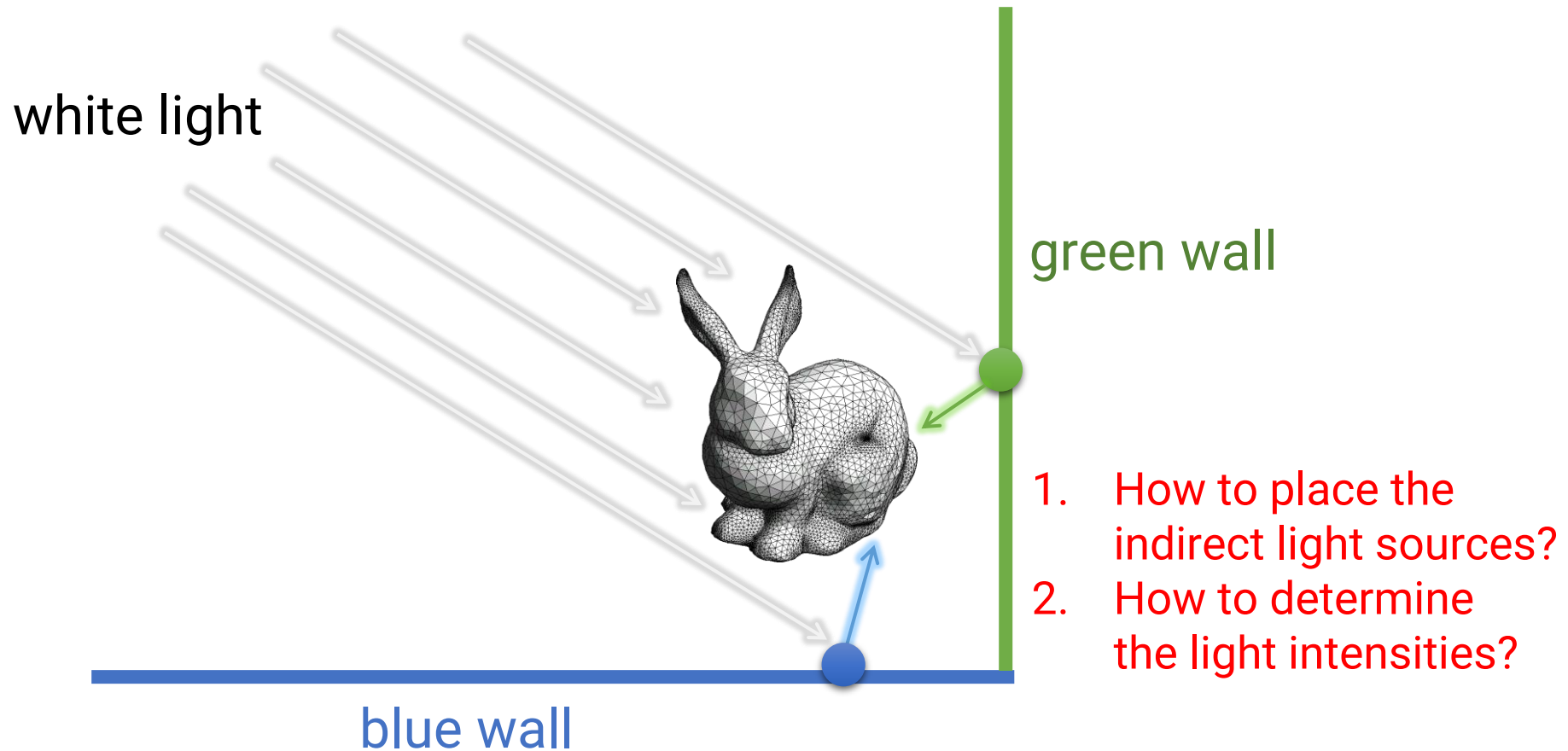
+ ambient occlusion

**not good enough**

# Global Illumination (cont.)



# Global Illumination (cont.)

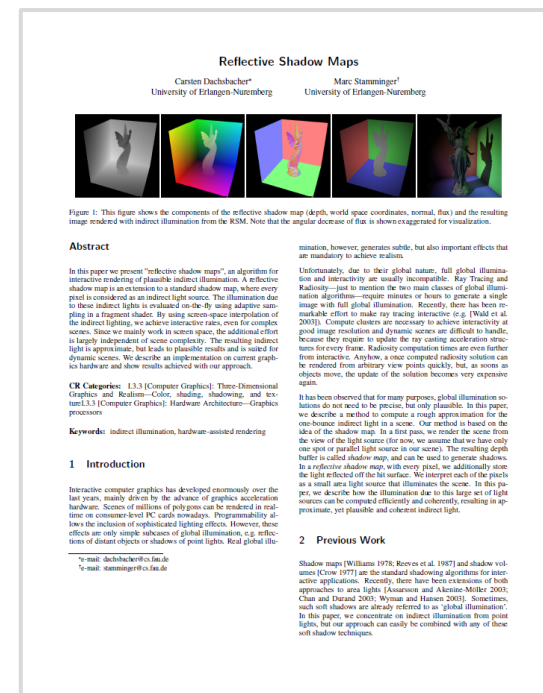


# Global Illumination (cont.)

- 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

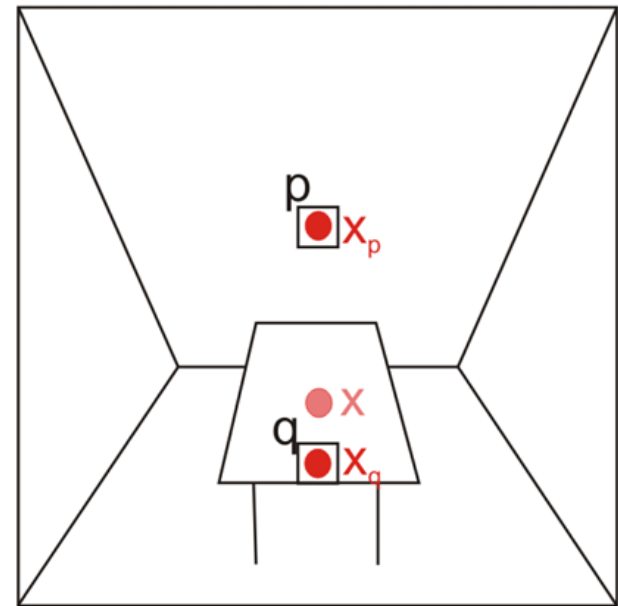
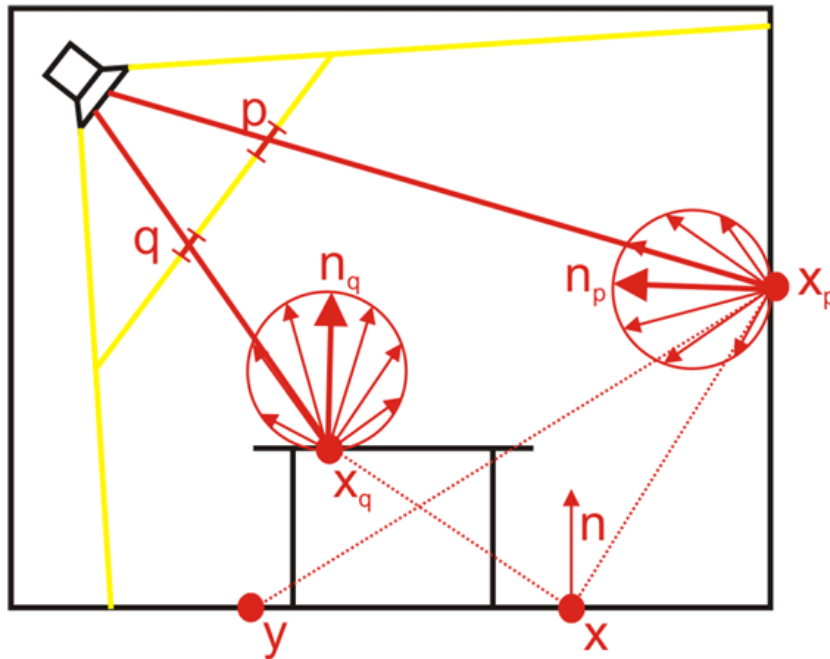




# Reflective Shadow Map (cont.)

## • Major idea

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

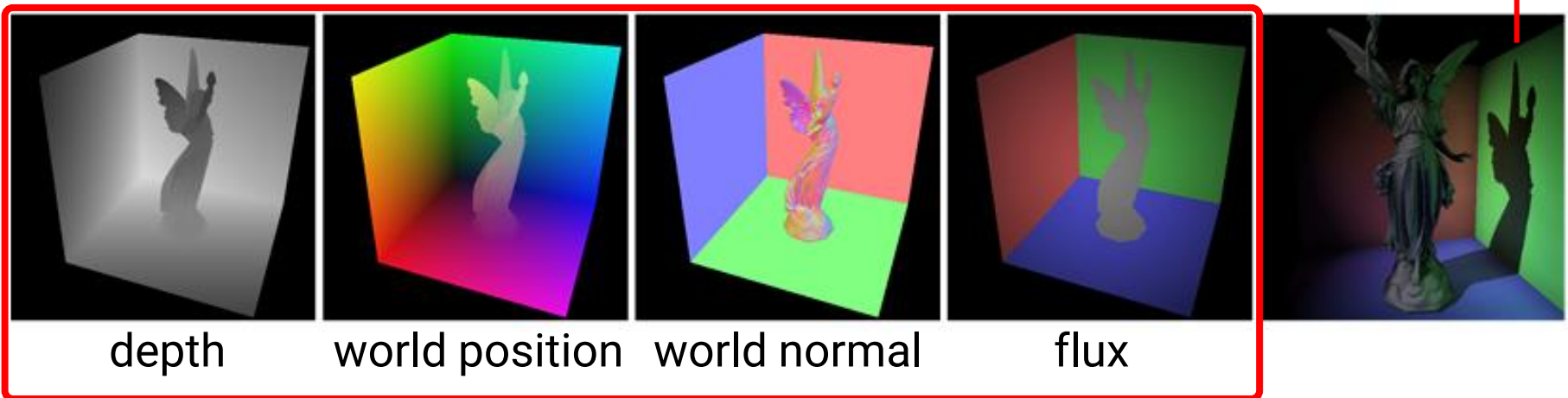




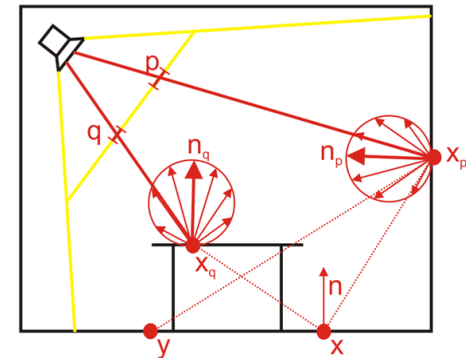
# Reflective Shadow Map (cont.)

- Two-pass rendering algorithm

**Pass II: render from the camera view**



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

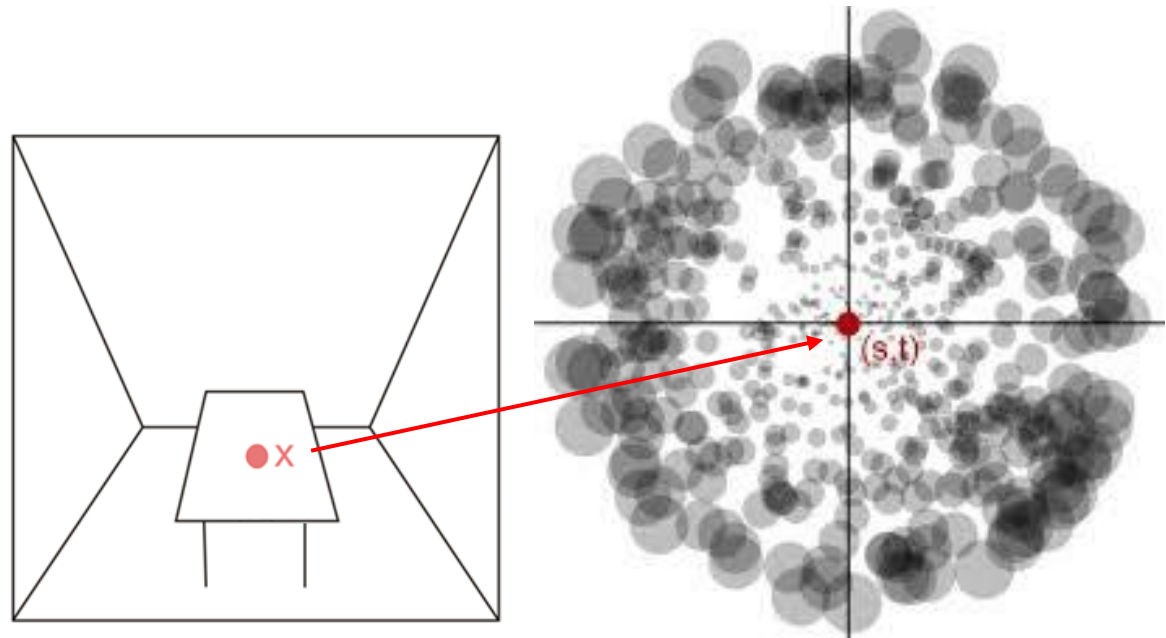


# Reflective Shadow Map (cont.)

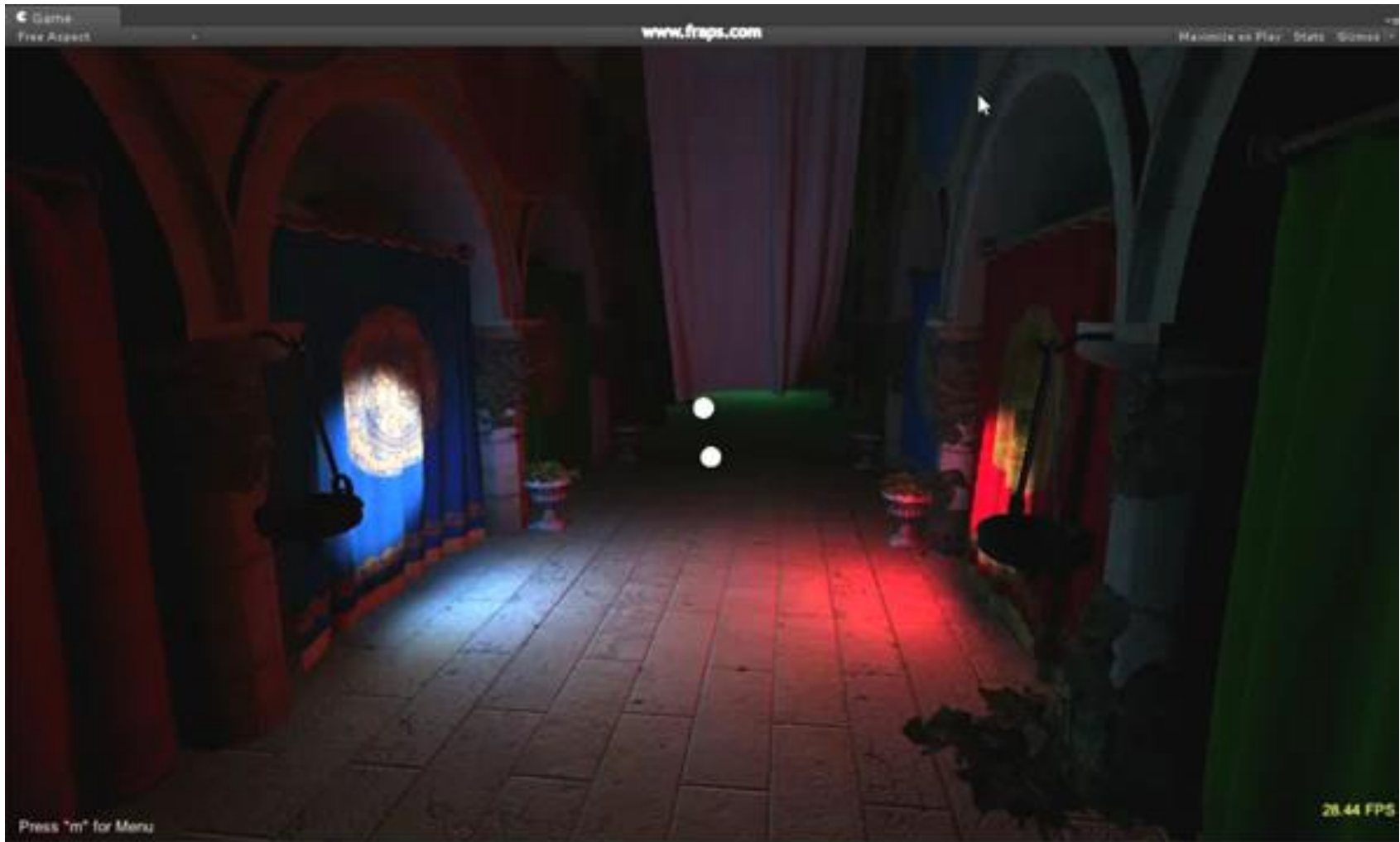
- **Pass I:** rendering G-buffer (called **RSM**) from the light view for generating indirect light sources
  - World-space position
  - World-space normal
  - Reflected flux
    - The intensity of the primary light source multiplied by the reflectance of the surface
- **Pass II:** rendering from the 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.)



**Any Questions?**