Foundations of rendering

Cornerstones of image synthesis

- 3D scene

- **Rendering**

- Raster image

Recap

- In previous lectures we have discussed how to model elements of 3D scene:

  - 3D model

  - Light

  - Camera

- Now, we will discuss how to combine scene elements to simulate interaction of light to create an image

Rendering: intuition

- Photography: Taking a photo from a real world:
  - Light source is emitting light into the space
  - Light travels through space and interacts with objects
  - Small portion of that light falls into camera, where image is created
- Physics: Interaction of light with objects in space and camera is well described in physics (wave and geometrical optics).
- Rendering is computer graphics tool which simulates light transport and interaction of light with objects in order to create an image.
  - It creates viewable 2D image from 3D scene

Rendering tasks

- In order to create an image from 3D scene, rendering algorithm must answer:
  - Visibility
  - Light transport
  - Shading

Visibility: high level

Light transport: high level

Shading: high level

Practical rendering approaches

Two main practical rendering approaches are:

- Ray-tracing based rendering

- Rasterization based rendering