Foundations of 3D Scene Modeling

3D scene in big picture

Cornerstones of image generation:

- **3D scene**

- Rendering algorithm

- Raster image

<IMAGE: high-level overview of three main components>

<IMAGE: tree-like structured knowledge of the course>

Introduction

Elements of any 3D scene:

- 3D model(s)

- Light source(s)

- Camera(s)

<IMAGE: high-level overview of three main components>

3D scene

- 3D scene modeling goes hand in hand with object oriented design.

- 3D scene representation has inherent tree-like structure thus often represented with so called **scene-graph**
  - Book: Foundations of Game Engine Development: Rendering (E. Lengyel)
  - Scene modeling tools: DCC examples

<IMAGE: COMPONENTS OF 3D SCENE AND SCENE GRAPH>

3D scene as a node graph

- 3D scenes, depending on application, can be extremely large.

- Elements of a 3D scene can be also seen as nodes and categorized into a diverse group of specific types based on their function in a scene.

- Root
  - 3D object
    - Shape
      - Mesh
    - Material
      - Scattering function
      - Texture
    - Collision shape
  - Camera
  - Light

- Example of production scene representation: https://github.com/appleseedhq/appleseed/wiki/Project-File-Format

3D scene

Representing 3D scene requires answers to following questions:

- How do we represent scene elements in a computer?
  - Intuitive for user?
  - Tractable for rendering?
- How we create scene elements?
  - How to use scene representations to create real-world phenomena and objects.
  - How do we manipulate 3D models?

Complex scene

<IMAGE: An motivation image that we will understand by the end of the lecture.>

Literature

- https://github.com/lorentzo/IntroductionToComputerGraphics/wiki/Foundations-of-3D-scene-modeling