3D Digital Content Production

Introduction to Computer Graphics

Can you guess who made this?

How about this?

Computer Graphics is a computational means to mimic the creation of visible things.

Then, what do you want to make with CG?

© NASA

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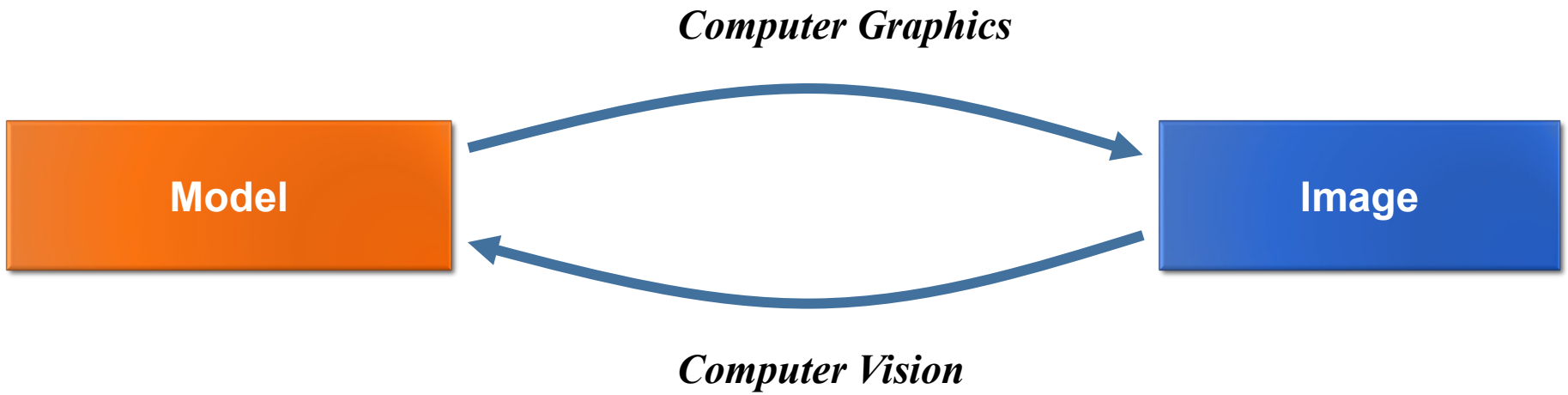
Computer Graphics

Synthesizing images from models



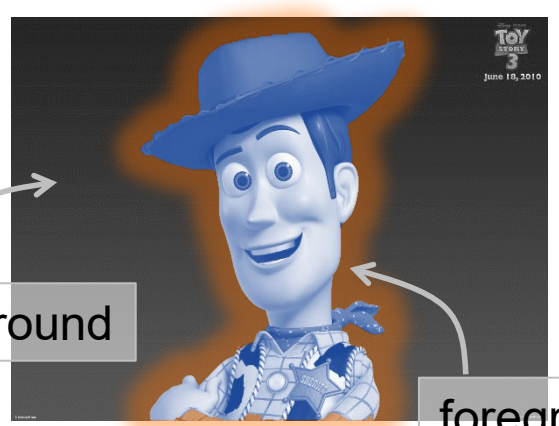
Understanding of images

© www.cgtrader.com/3d-models/
character/man/woody

Computer Graphics

© Pixar

Computer Vision



© Pixar

background

foreground
figure

Applications

Broadcast

© www.arenaanimationcp.com/aaip-broadcast/

Video Games

© Electronic Arts (FIFA 18)

Feature Films

© Disney (toystory.disney.com)

User Interface

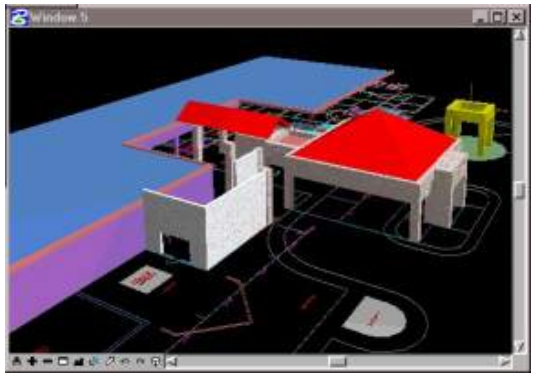
© Mentor Graphics

Medical Imaging

[Brun et al. 2004]

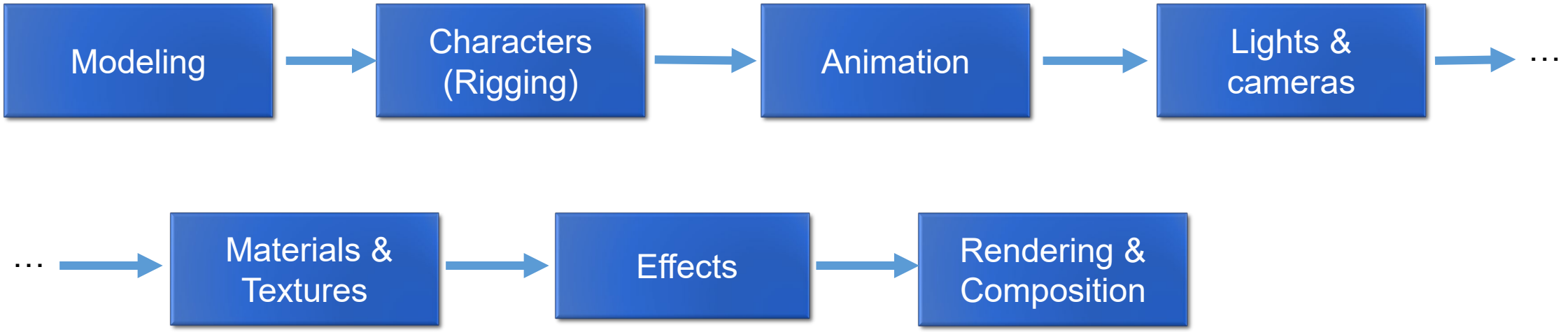
Virtual Reality

CAD (Computer Aided Design)



Animation Pipeline

- Description
  - A number of different stages lead up to a final animated 3D sequence.
  - Each stage of 3D animation is an area of study in its own right.
  - The common animation pipeline includes at least the following seven stages:

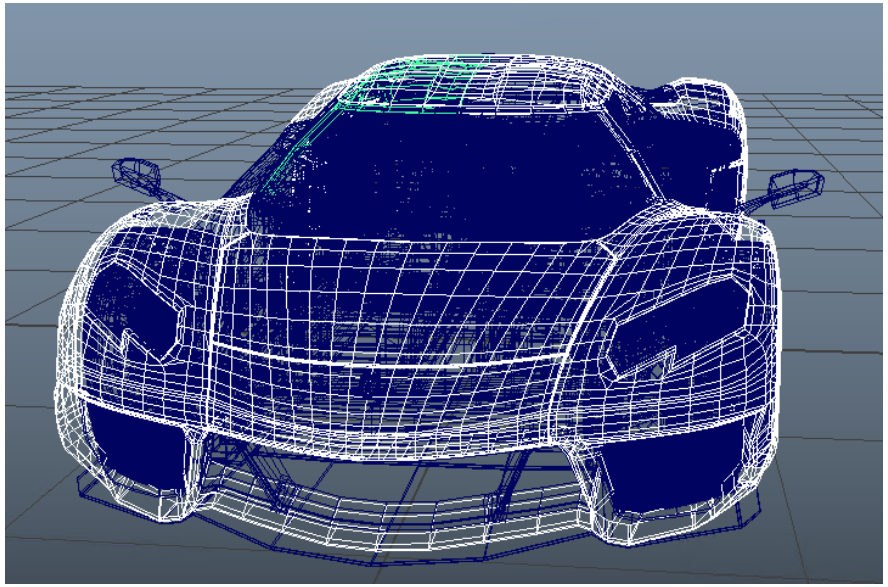


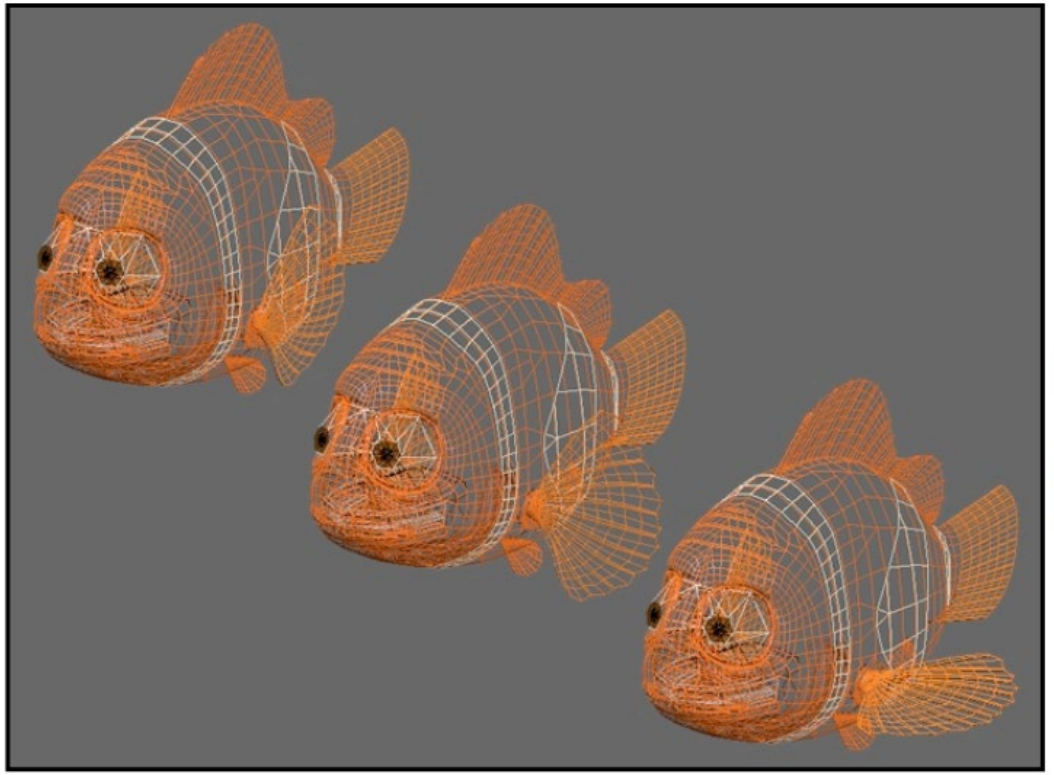
* This is one of possible pipelines. The pipeline can be partly rearranged or repeated.

Modeling

- Building 3D geometry for all models in the scene such as characters or buildings, etc.

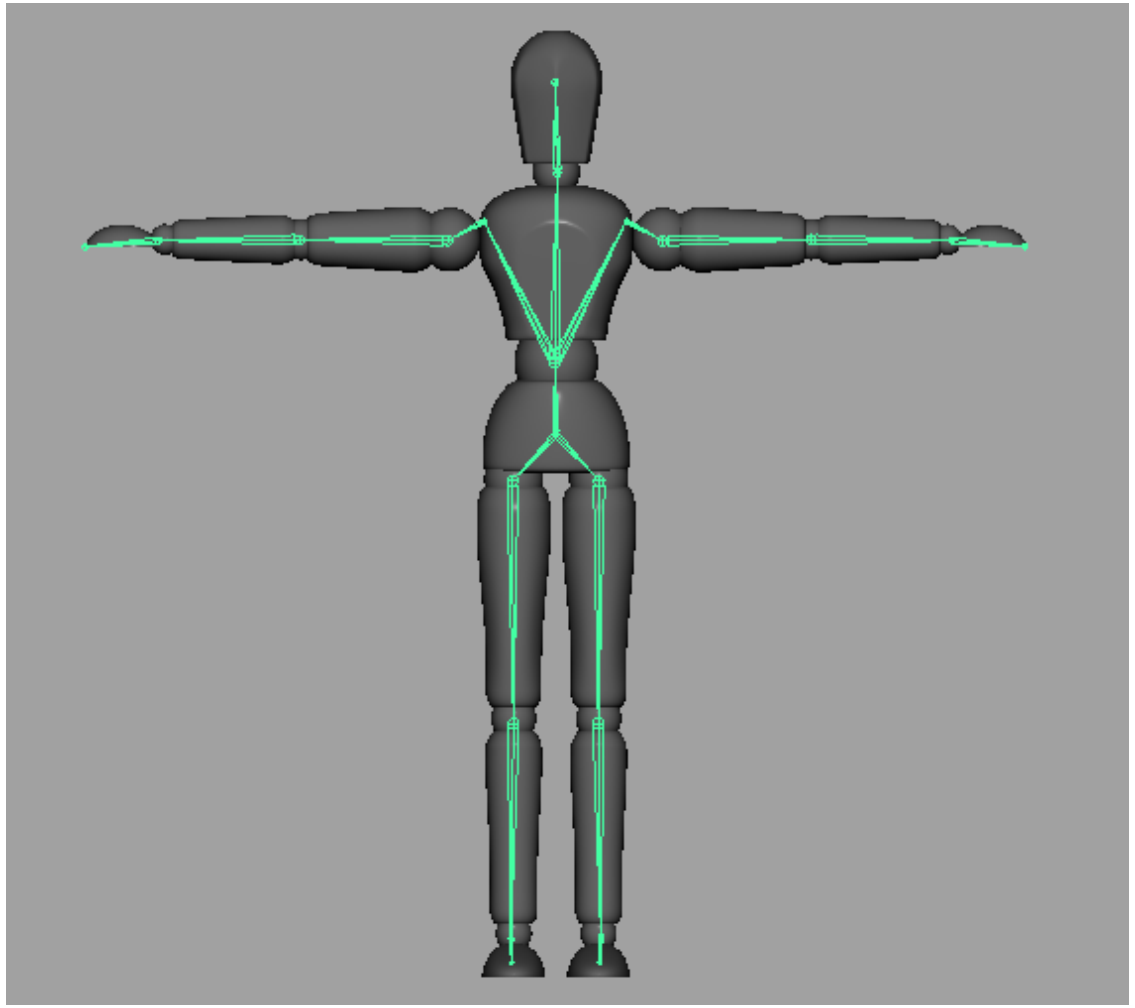
- Defining the shape of a model





Characters (Rigging)

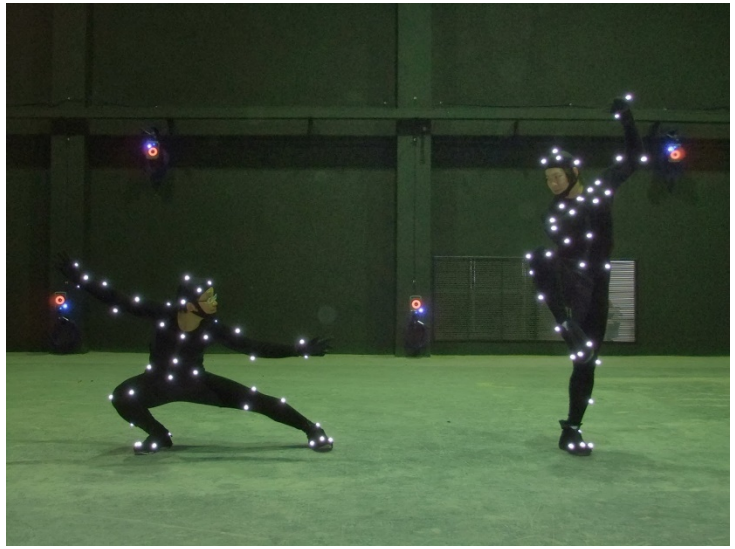
- The process of ***embedding a skeleton and quipping your geometric model with*** appropriate controllers *called* ***rigs***



Animation

- Producing character movement or facial expression
- For example, key frame animation and motion capture

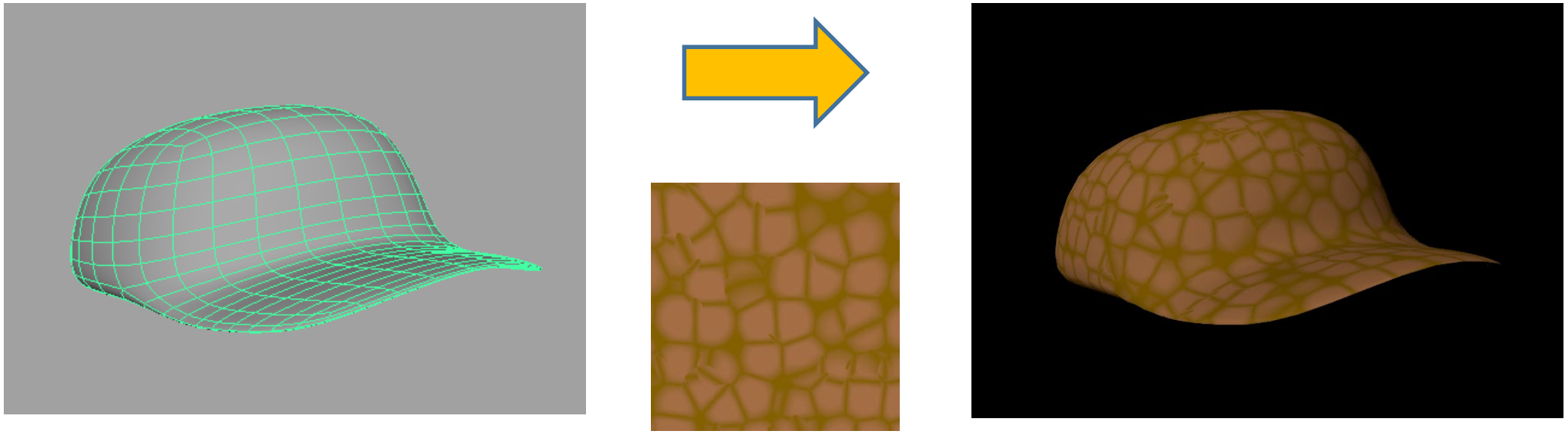
Key frame animation



Motion capture

Materials & Textures

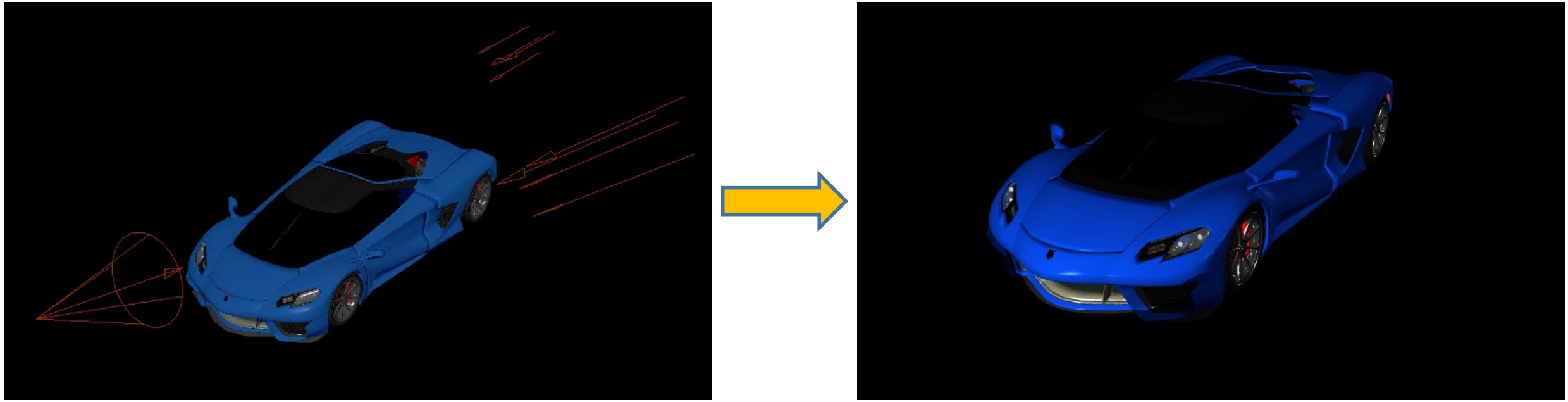
- Giving surface attributes, i.e., defining how it will be shaded by light
- Textures added to bring visual richness to surfaces of a model



Texture image

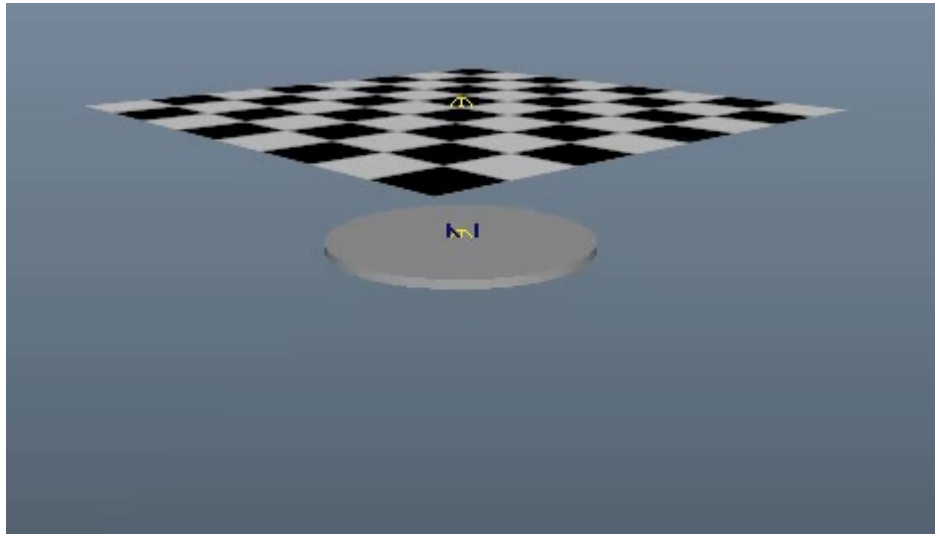
Lights and Cameras

- Placement of lights & a camera in a scene to achieve desired effects.
- Different types of lights and cameras placed in different locations while changing parameters



Effects

- Used to generate special phenomena or scenery that are difficult to represent with modeling and texturing; e.g., smoke, fire, hairs, fluid, cloth, grass, etc.
- Relying on particle simulations and/or physics-based simulation, which are computationally expensive in general



Cloth simulation

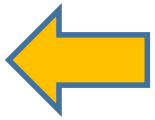
Grass and flowers

Rendering and compositing

- Synthesizing a single image or a sequence of images (a final 3D animation) by putting all together such as the surface properties, lighting, shadows, movement, and shape of objects, etc.
- Fine-tuning of rendering parameters to get what you have intended
- Also rendering objects separately and bringing them back together in 2D using a compositing system

Video Lectures

1. Introduction to CG
   - https://hducc.handong.edu/em/5fa1617ceb7fa
2. Animation Pipeline
   - https://hducc.handong.edu/em/5fa1635ba3dfa
3. The Solar System 1 - Part 1
   - https://hducc.handong.edu/em/5fa163963fb02
4. The Solar System 1 - Part 2
   - https://hducc.handong.edu/em/5fa16775bffbe
5. The Solar System 2
   - https://hducc.handong.edu/em/5fa1659677bd7



Online Practice