# Computer Graphics

CS 217

# Overview

- Introduction
  - What is computer graphics?

- Applications
  - What is it good for?

- Systems & software
  - How does it related to this course?

- Course evaluations

# Introduction

- What is computer graphics?
  - Imaging = *representing 2D images*
  - Modeling = *representing 3D objects*
  - Rendering = *constructing 2D images from 3D models*
  - Animation = *simulating changes over time*

Jurasic Park
*(Industrial, Light, & Magic)*

Alone in the Dark 4
*(Darkworks/Infogrames)*

# Imaging

- Manipulating images
  - Filtering
  - Warping
  - Composition
  - Morphing

Image Warping
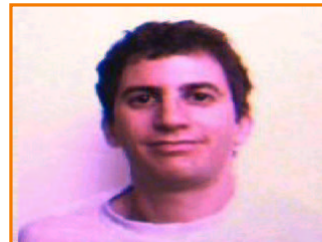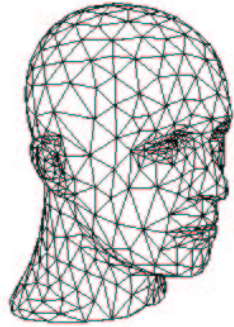
Image Composition
*(Michael Bostock, CS426, Fall99)*

Image Morphing
*(All students in CS 426, Fall98)*

# Modeling

- Describing shapes and surface properties
  - Curves
  - Surfaces
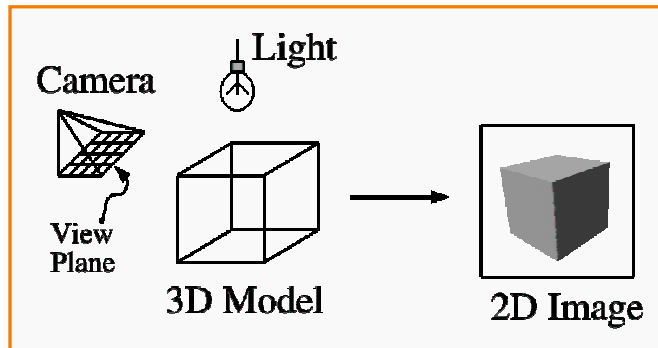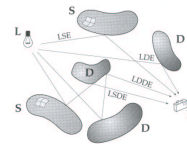  - Solids



*(Denis Zorin, CalTech)*

*(Marc Levoy et al., Stanford University)*

# Rendering

- Creating 2D image from 3D model
  - Camera models
  - Hidden surface removal
  - Light transport
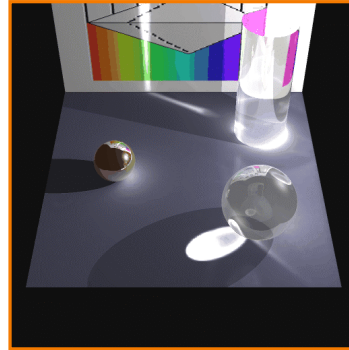
# Rendering

- Creating 2D image from 3D model
  - Camera models
  - Hidden surface removal
  - Light transport
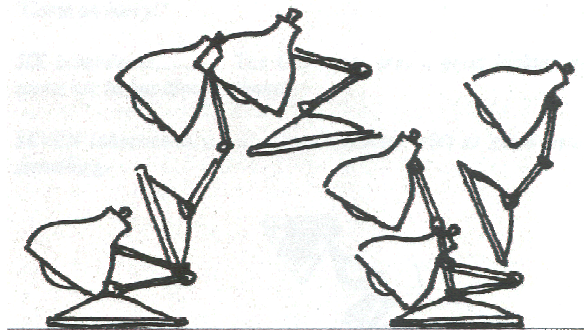
Trike
*(James Percy, CS 426, Fall99)*

Rendering Caustics
*(Michael Bostock, James Percy & Casey McTaggert, CS 426, Fall99)*

# Animation

- Describing how models move
  - Kinematics
  - Dynamics
  - Planning
  - Learning

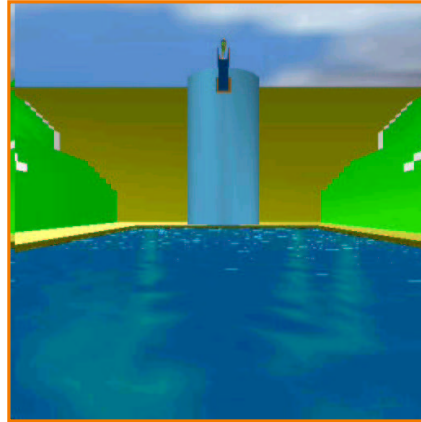*(Lasseter87)*

# Animation

- Describing how models move
  - Kinematics
  - Dynamics



Ice Queen
*(Mao Chen, Zaijin Guan, Zhiyan Liu, & Xiaohu Qie, CS426, Fall98)*

Diving Simulation
*(Ding Liu, Chi Zhang, & Ming Zhang, CS 426, Fall99)*

# Applications

- Entertainment

- Computer-aided design

- Scientific visualization

- Training

- Education

- E-commerce

- Computer art

# Applications

→ **Entertainment**

- Computer-aided design

- Scientific visualization

- Training

- Education

- E-commerce

- Computer art

Jurasic Park
*(Industrial, Light, & Magic)*

Geri's Game
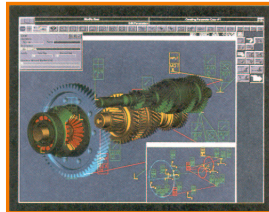*(Pixar Animation Studios)*

Quake
*(Id Software)*

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# Applications

- Entertainment

→ **Computer-aided design**

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Los Angeles Airport
*(Bill Jepson, UCLA)*
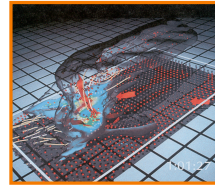
Gear Shaft Design
*(Intergraph Corporation)*

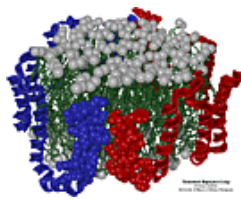Boeing 777 Airplane
*(Boeing Corporation)*

# Applications

- Entertainment
- Computer-aided design
- ➤ **Scientific visualization**
- Training
- Education
- E-commerce
- Computer art


Airflow Inside a Thunderstorm
*(Bob Wilhelmson,
University of Illinois at Urbana-Champaign)*


Apo A-1
*(Theoretical Biophysics Group,
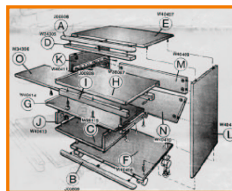University of Illinois at Urbana-Champaign)*


Visible Human
*(National Library of Medicine)*

# Applications
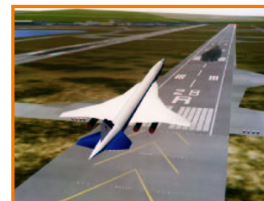
- Entertainment
- Computer-aided design
- Scientific visualization
- ➤ **Training**
- Education
- E-commerce
- Computer art


Driving Simulation
*(Evans & Sutherland)*


Desk Assembly
*(Silicon Graphics, Inc.)*
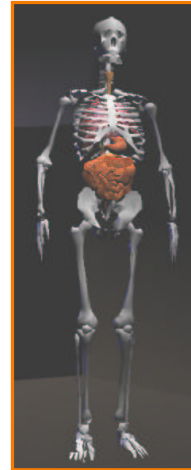

Flight Simulation
*(NASA)*

# Applications

- Entertainment
- Computer-aided design
- Scientific visualization
- Training
- ➜ **Education**
- E-commerce
- Computer art


Forum of Trajan
*(Bill Jepson, UCLA)*


Human Skeleton
*(SGI)*

# Applications

- Entertainment
- Computer-aided design
- Scientific visualization
- Training
- Education
- ➜ **E-commerce**
- Computer art


Interactive Kitchen Planner
*(Matsushita)*


Virtual Phone Store
*(Lucent Technologies)*

## Applications

- Entertainment
- Computer-aided design
- Scientific visualization
- Training
- Education
- E-commerce
- **Computer art**



Blair Arch
*(Marissa Range & Adam Finkelstein,
Princeton University)c*

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# Systems & Software

- Computer graphics uses …
  - Parsers (lexical and syntactic analysis)
  - Abstract data types
  - Memory management
  - Multiple processes
  - Networking



# Systems & Software

- Computer graphics uses …
  - Parsers (lexical and syntactic analysis)
  - Abstract data types
  - Memory management
  - Multiple processes
  - Networking
  - Real-time code
  - Assembly code
    (maybe, a little)



Alone in the Dark 4
*(Darkworks/Infogrames)*

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