Computer Graphics

Leif Kobbelt

Public Perception of CG

- Games

- Movies

Computer Graphics Research

- fundamental algorithms & data structures
  - continuous & discrete mathematics
  - optimization schemes

- general CG functionality
  - 3D reconstruction
  - global light simulation
  - image matching
  - interactive modeling

- specific applications
  - CAD / CAM
  - medical computing
  - simulation sciences
  - mobile multimedia
  - architecture
  - computer games
  - movie production
  - ...

Methodological Approaches

- efficent computation
  - use concepts from high performance computing
  - sparse linear systems
  - graph problems

- exploit domain specific knowledge
  - efficiency and robustness
  - *heuristics*

- put the user into the loop
  - instead of parameter tuning
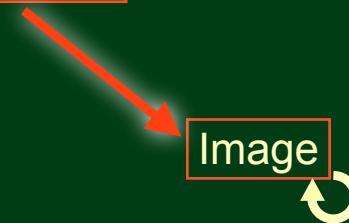 - intuitive user interfaces
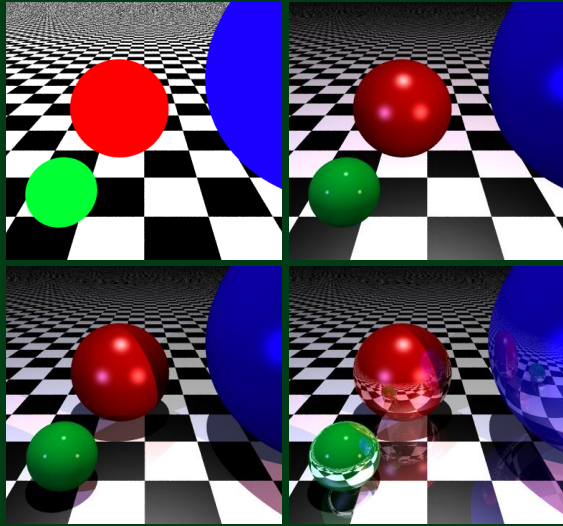
Computer Graphics Landscape

Image

Image Completion
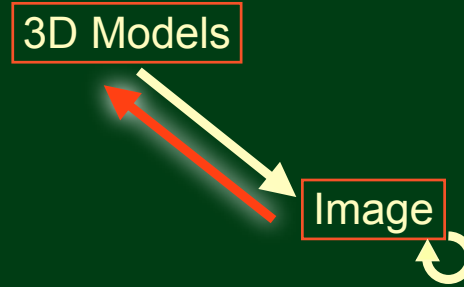
Image Completion

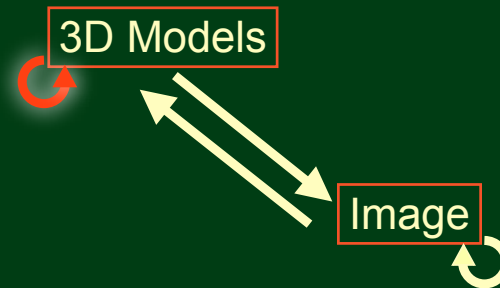# Computer Graphics Landscape

3D Models

Image

Rendering

Computer Graphics Landscape

3D Models → Image

3D Reconstruction
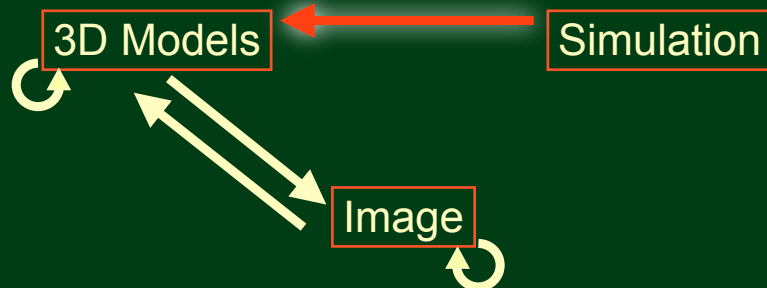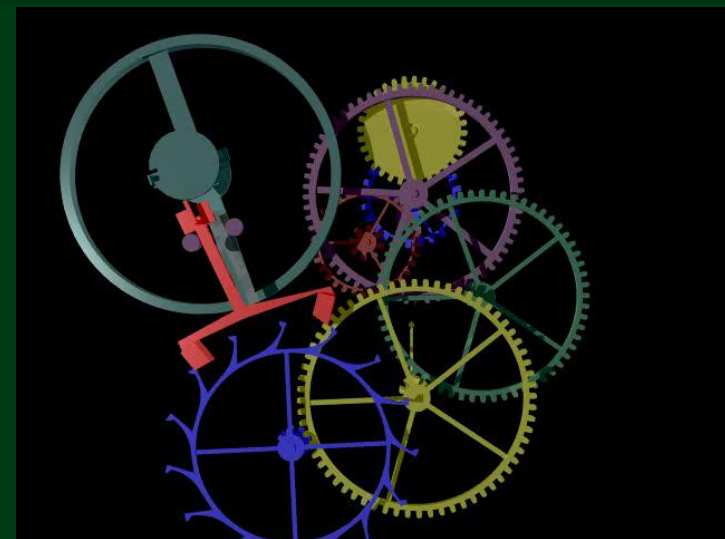

Computer Graphics Landscape

3D Models → Image

Geometry Processing
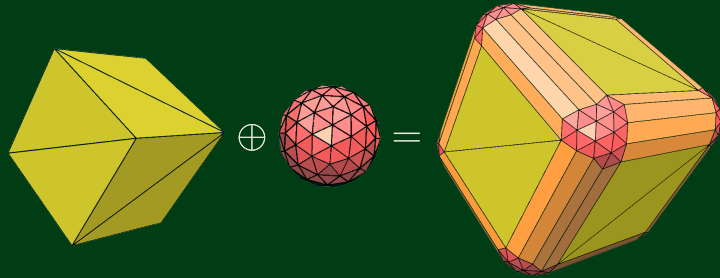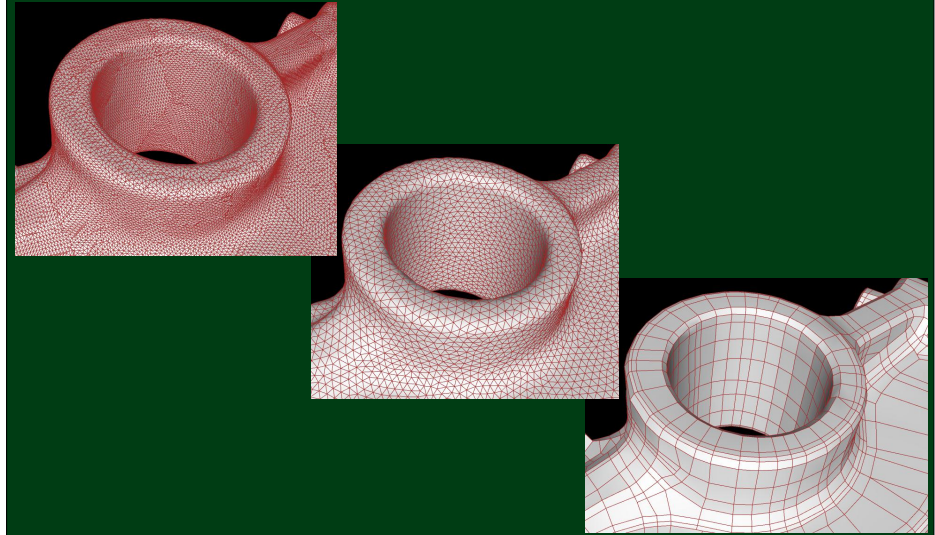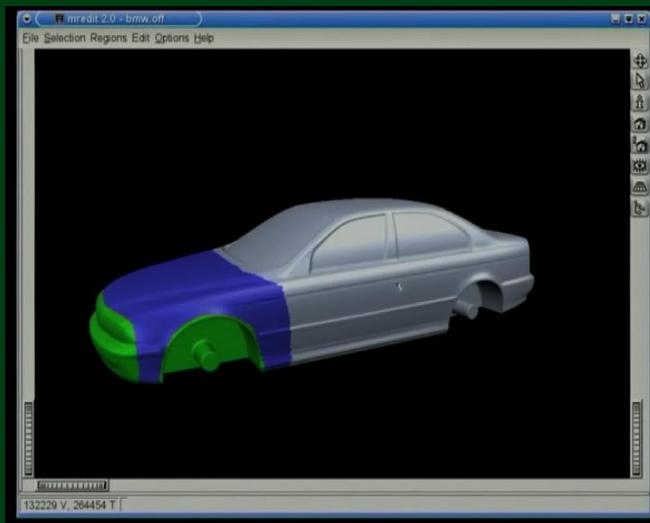
Geometry Processing

Computer Graphics Landscape

3D Models ← Simulation

3D Models ↔ Image

Animation
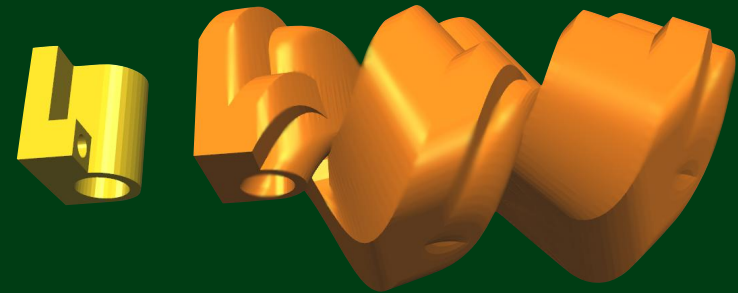
Computer Graphics Landscape

3D Models ← Simulation
3D Models → Simulation
3D Models ↔ Image
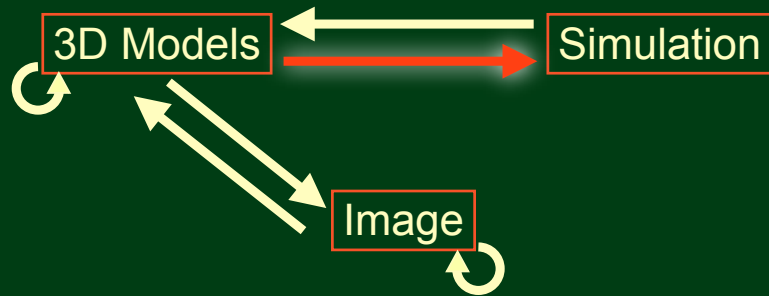
Polygon Mesh Optimization

CAD Modeling

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Computer Graphics Landscape

3D Models ← Simulation
3D Models → Simulation
3D Models ↔ Image
Simulation → Image
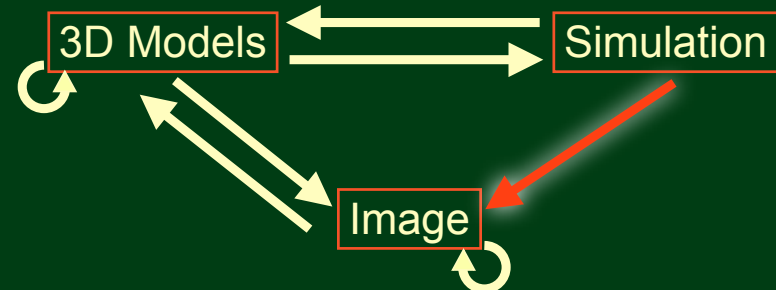
Scientific Visualization
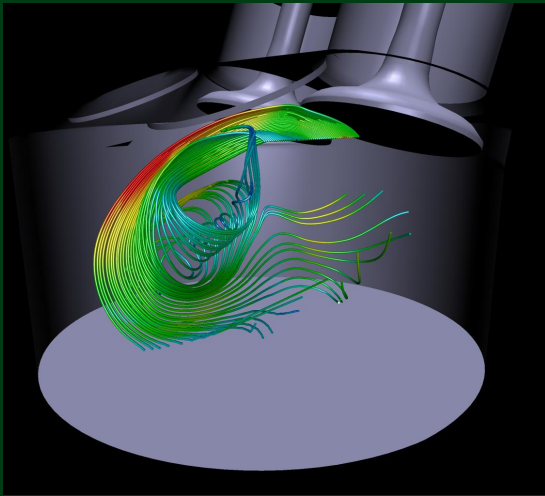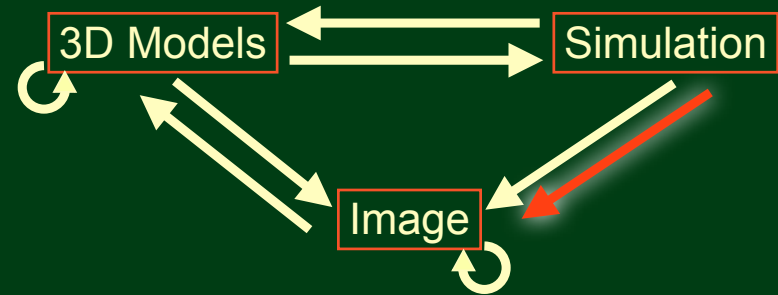
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Leif Kobbelt

Computer Graphics Landscape

3D Models ← Simulation
3D Models → Simulation
3D Models → Image
Simulation → Image
Image

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Global Illumination

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Computer Graphics Landscape

Real Objects → 3D Models
3D Models ← Simulation
3D Models → Simulation
3D Models → Image
Simulation → Image
Image
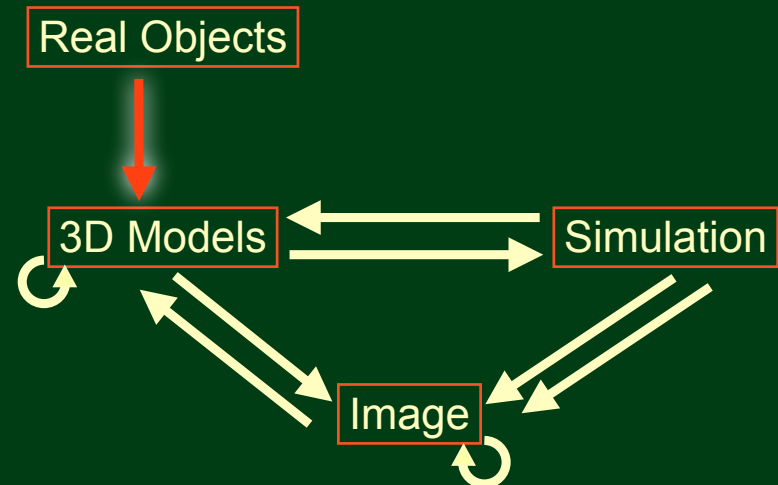
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3D Laser Scanning
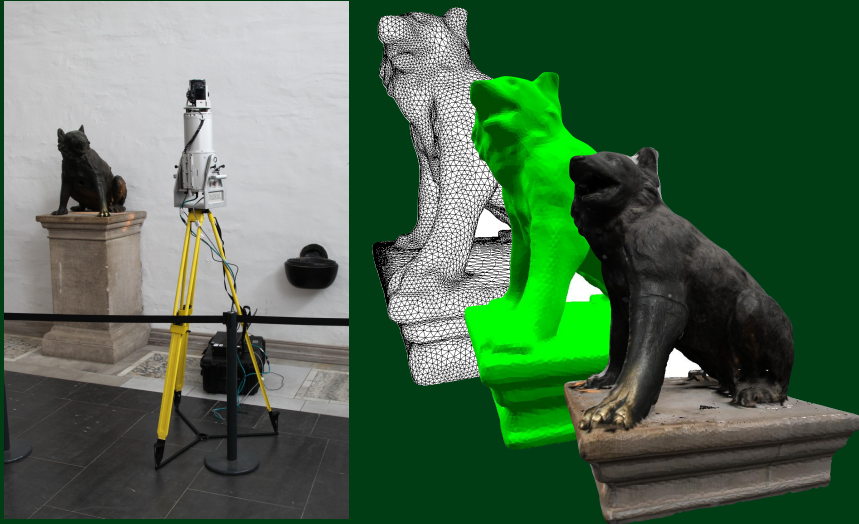
Multiview Stereo

Computer Tomography

Computer Graphics Landscape

Real Objects

3D Models → Simulation
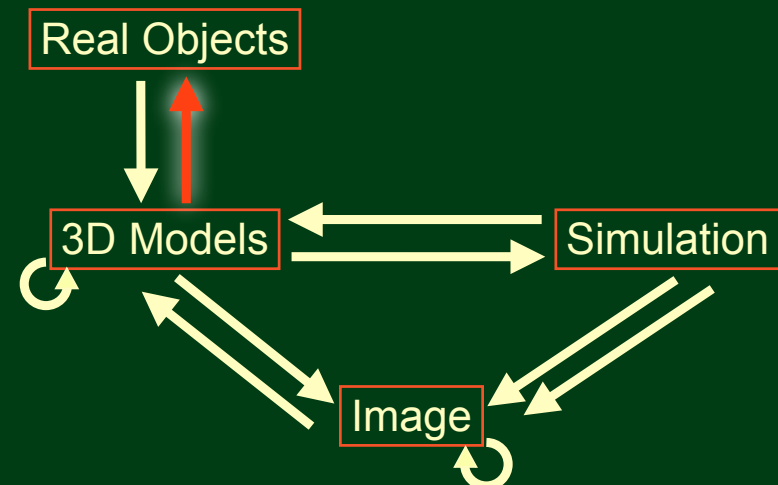
Image

Rapid Prototyping

Computer Graphics Landscape

Real Objects

Physical World

3D Models

Simulation
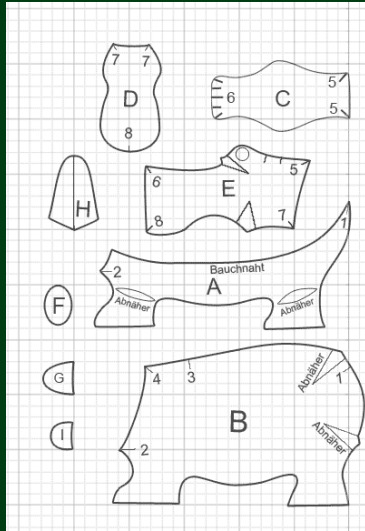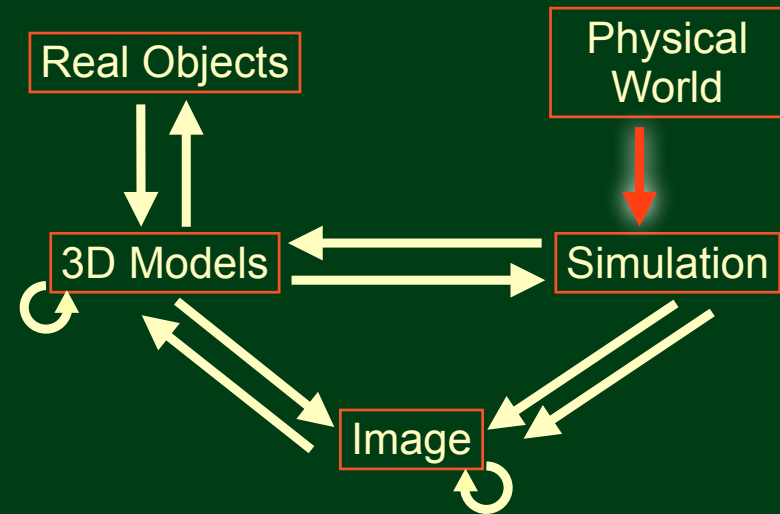
Image

Virtual Aachen Project
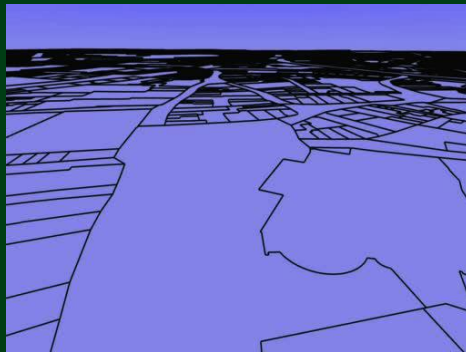
Virtual Aachen Project

Computer Graphics Landscape

| Real Objects |
| 3D Models | Simulation |
| Image |

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Radio Wave Propagation

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Computer Graphics Landscape

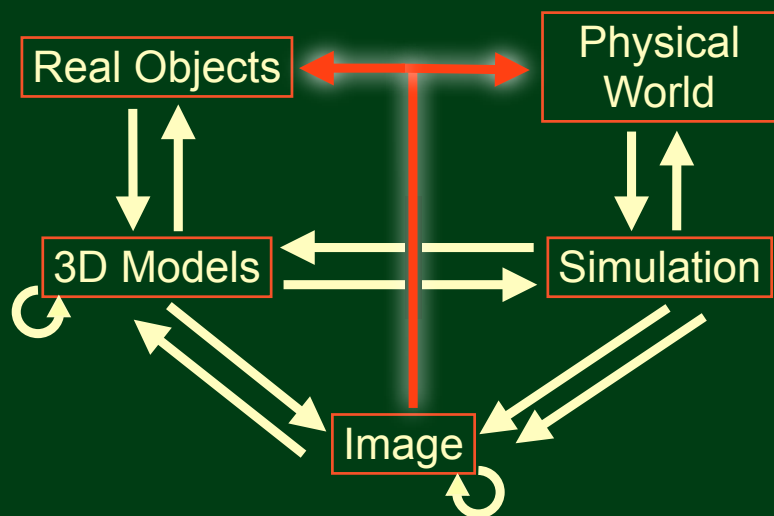| Real Objects | Physical World |
| 3D Models | Simulation |
| Image |

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Image Matching & (Self-)Localization
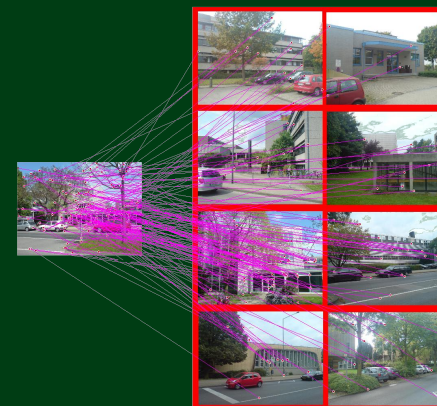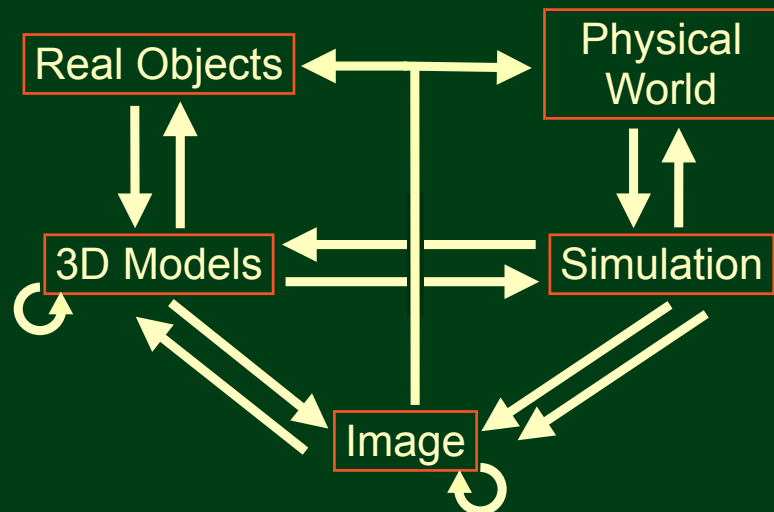

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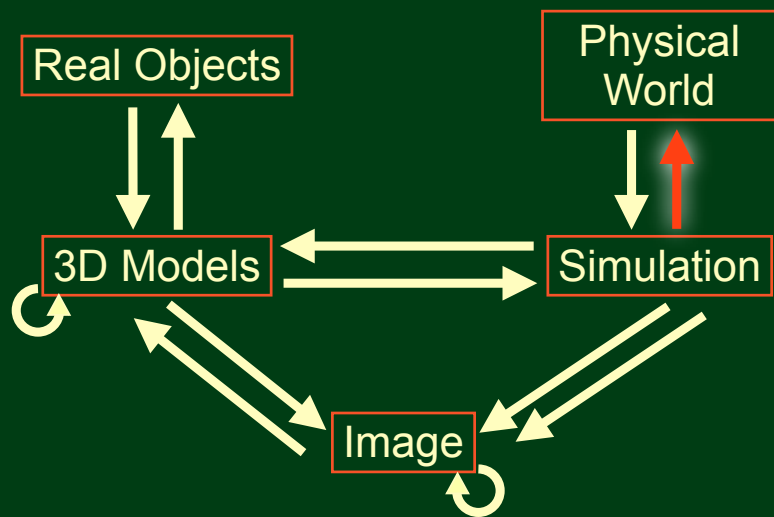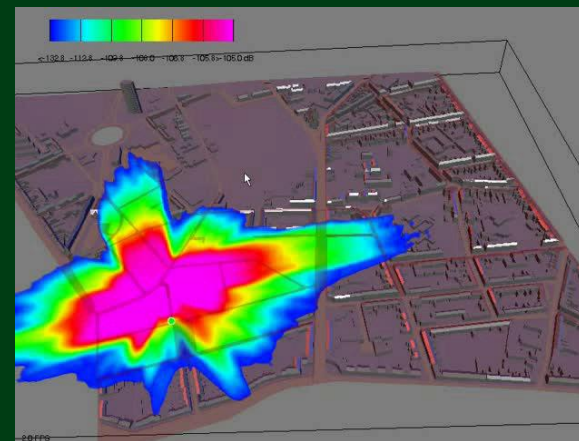
Image Matching & (Self-)Localization

Image Matching & (Self-)Localization

Computer Graphics Landscape

Computer Graphics Classes

- Introduction to CG (WPF für Bachelor) --> WS
- (Pro-) Seminare
- Praktika
  - game development (iphone, kinect)
- Geometry Processing
- Global Illumination & Image-based Rendering