Visualisation, Rendering and Animation
2 VO / 1 KU (2001-2004)

Heinz Mayer, Franz Leberl & Andrej Ferko

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Short podcast version 2020

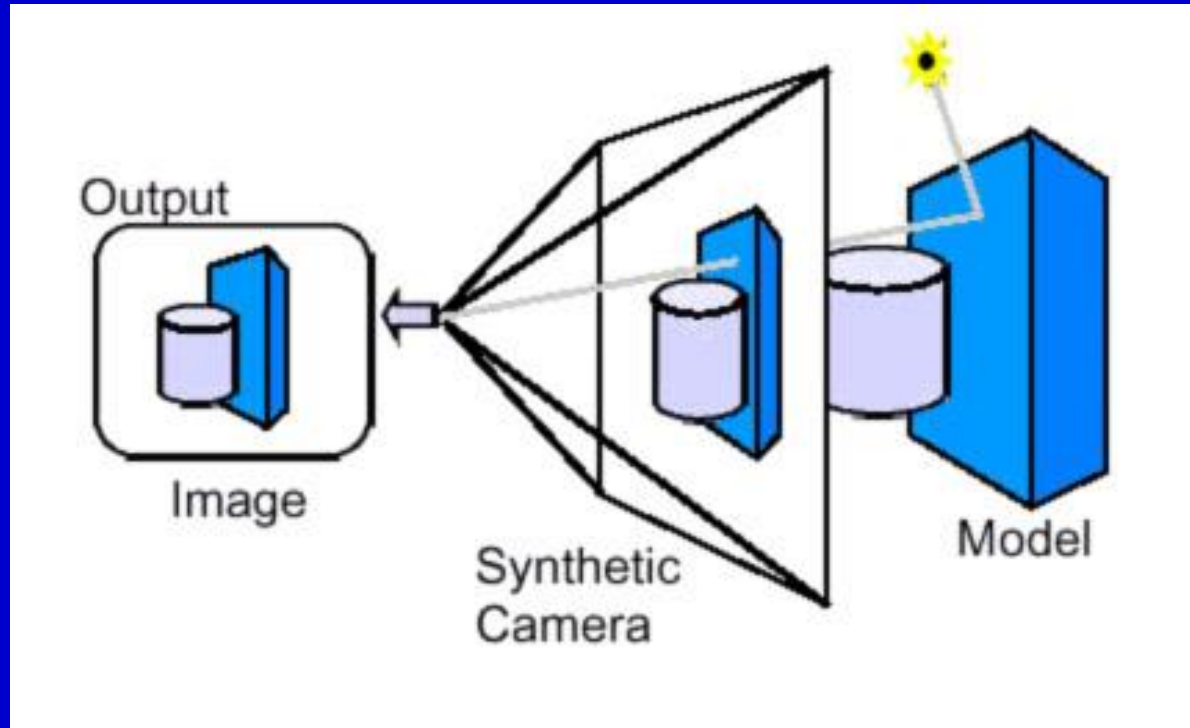# Image-Based Rendering

Heinz Mayer, Andrej Ferko

Institut für Maschinelles Sehen und Darstellen
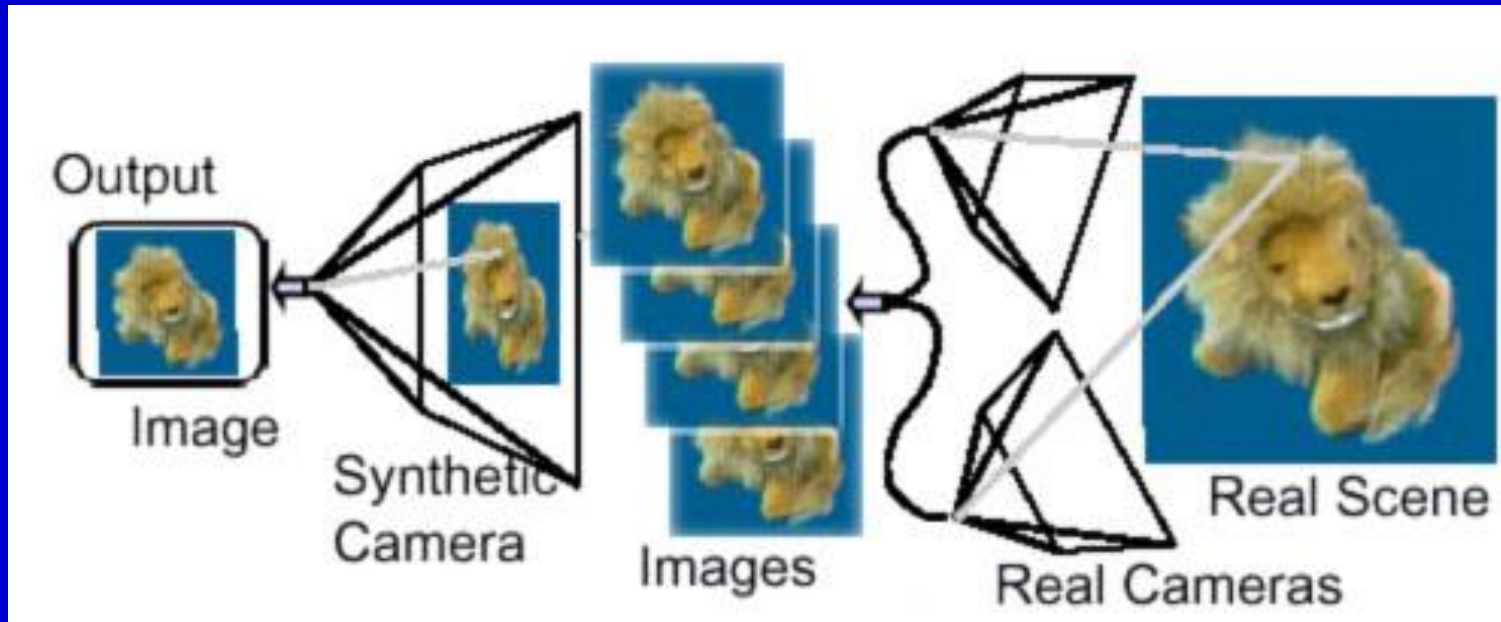
Tracking Technologies

- *Mainly position & orientation*
- *Movement freedom*
- *Important evaluation criteria*
  - *measuring rate*
  - *latency time*
  - *precision*
  - *resolution*
  - *operation extent (& appropriate precision)*

Model-Based-Rendering

The real scene built with geometric objects

Image-Based-Rendering

Varied views on real scene combined to the new one

Comparison

| Model-Based-Rendering	Image-Based-Rendering
Based on 3D model	Based on photos/stills
Expenditure strogly depends on scene complexity	Expenditure independent from scene complexity
Requires expensive SW for realistic results	Realism depends on input-data only
Special HW necessary	Processor suffices
Conventional Rendering-Pipeline	Pixel projection and Pixel interpolation

View Interpolation

Recording Systems

Rotating Platform
- *CCD-lines*
- *CCD-camera*
- *Stereocameras pair*

Panoramas from

exponed positions

Nodal point

Camera mounted sideways

Rotation

Leveling
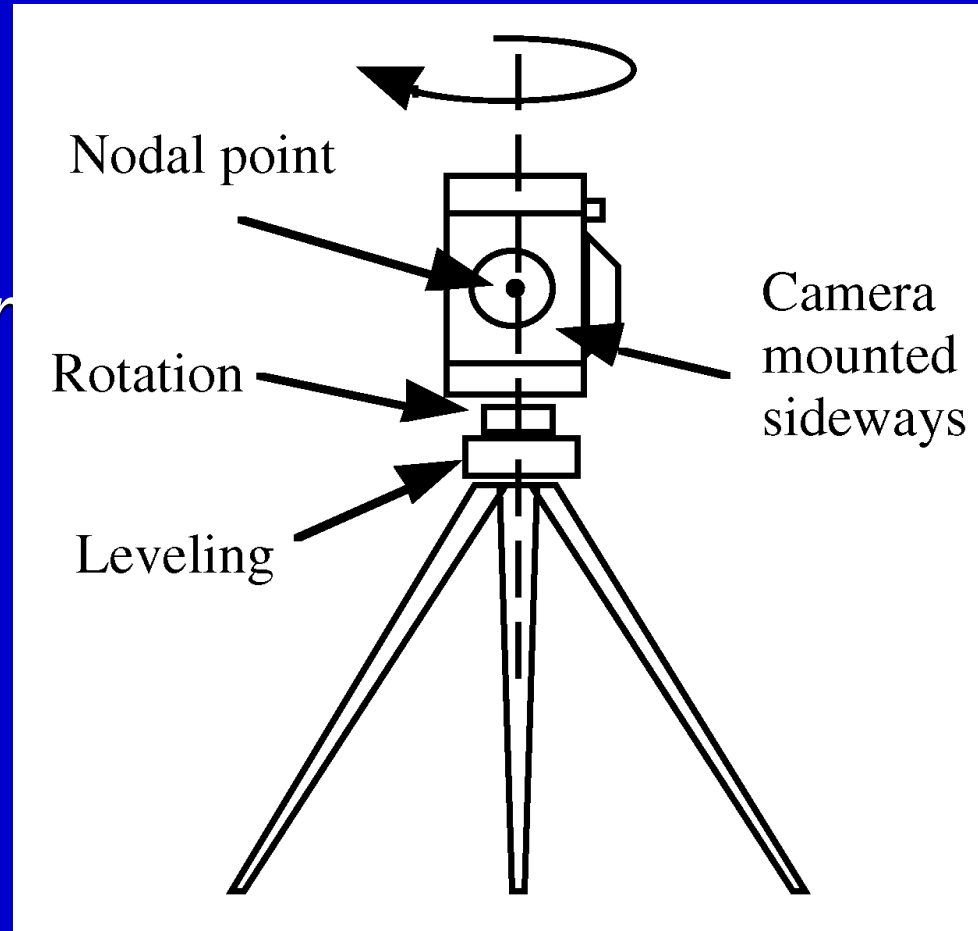
From Panoramic Images to Image Synthesis
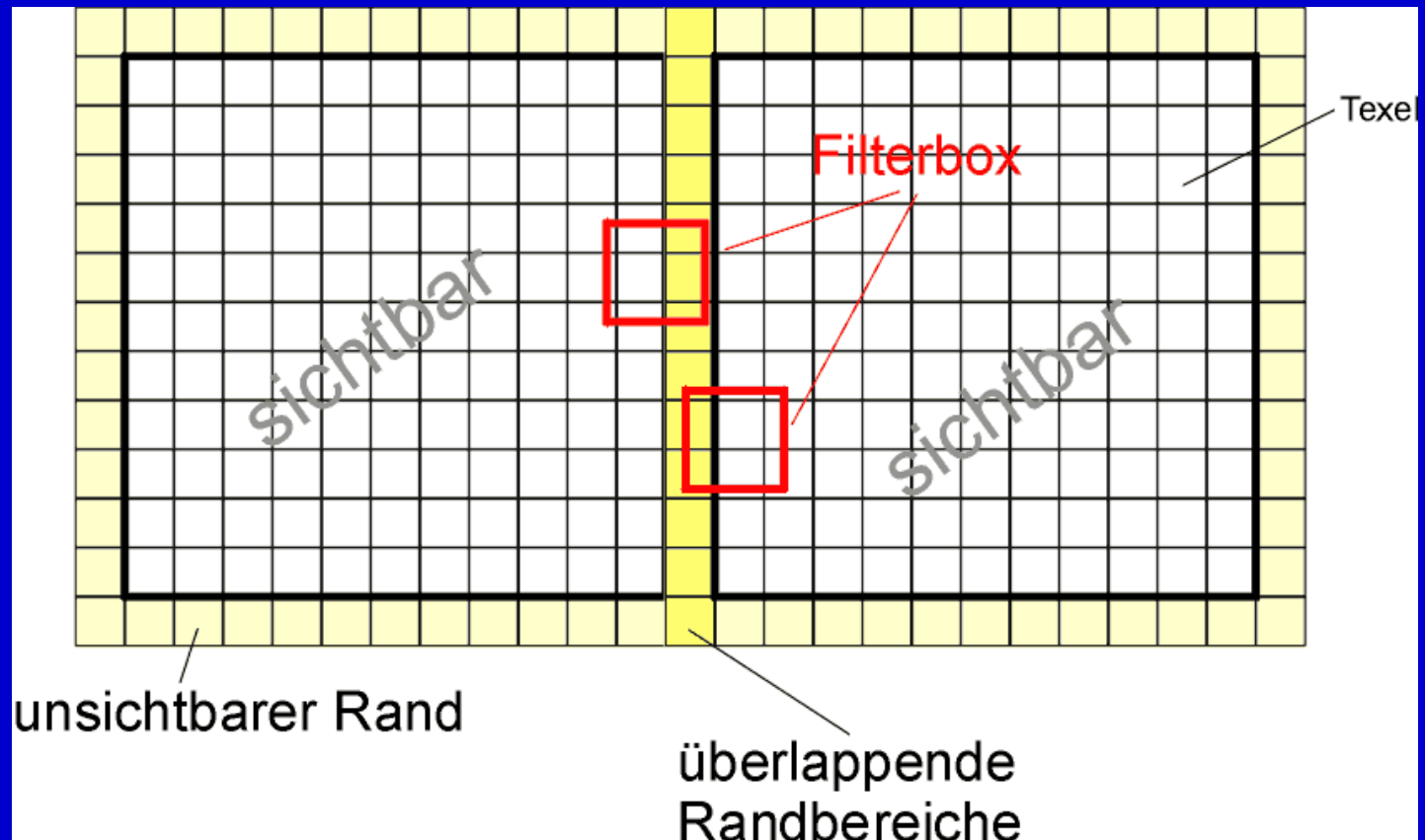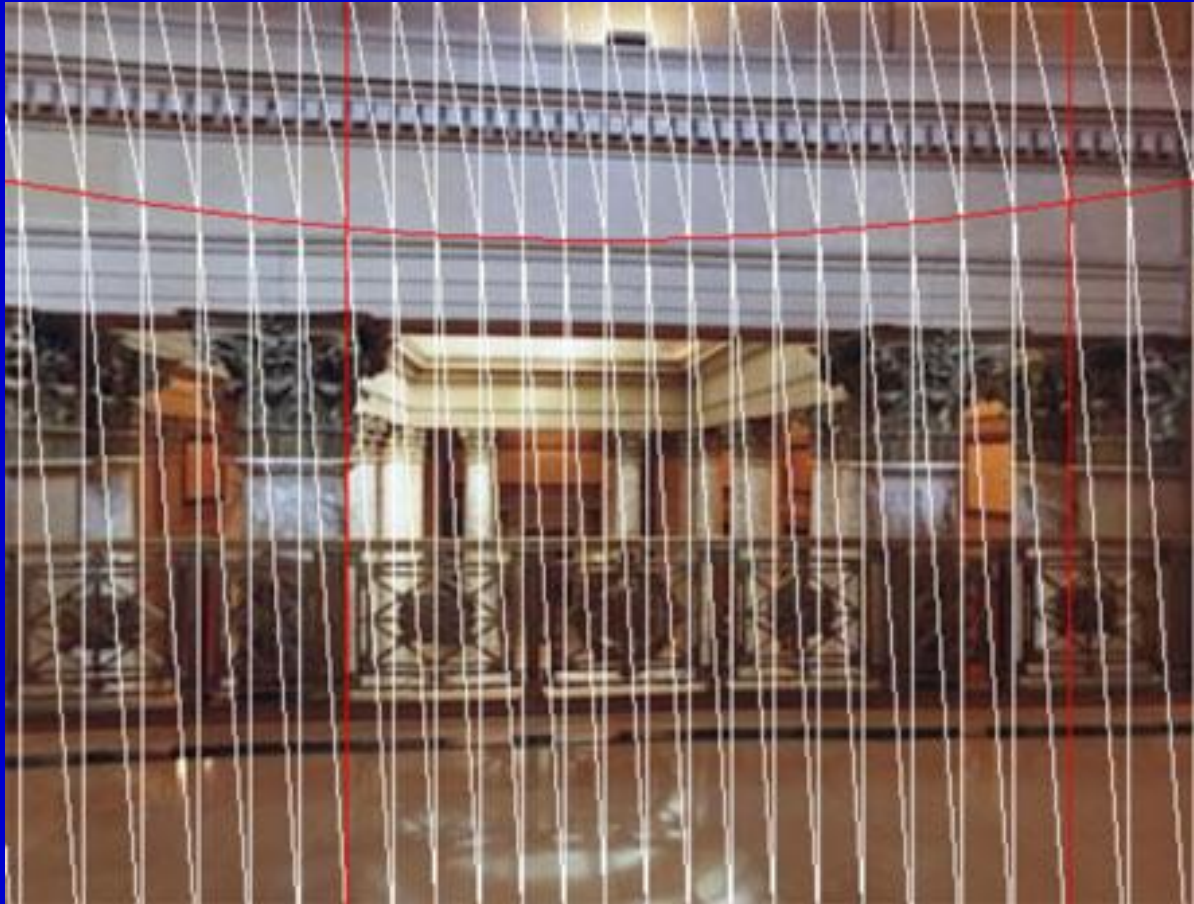
Functionality

- *Panorama image equalize*
- *Inner side of a cylinder panorama texturing*
- *Look up from the central axis*
- *Camera rotation: turn and declination*
- *Zoom*

Partial Images Overlap

Texel

Filterbox

sichtbar

sichtbar

unsichtbarer Rand

überlappende
Randbereiche

Results

View straightened out   Polygon boundary

Panoramic Stereo Imaging

- *Utilize a rotating stereo-camera pair for image acquisition*
- *Method:*
  - *image input (doubled)*
  - *projection warping*
  - *epipolar correction*
  - *displacement correction*
- *Stereoscopic visualisation*

IBR-like Idea

- *Use photographs of lightsources*
- *2001: SIGGRAPH Award for Paul Debevec*
- *IMAGE-BASED LIGHTING*
- *www.debevec.com*
- *movies*

IMAGE-BASED LIGHTING

- *2001: Paul Debevec, CVPR 2001 Short Course, 3.5 hours*

- *IMAGE-BASED LIGHTING:*

- *„integrating computer-generated imagery with live action photography that use measurements of real-world lighting to illuminate CG objects"*

IBL Survey

- **High-dynamic range images HDRI**
- **lighting acquisition (M. Gross)**
- **IBL and compositing**
- **real-time techniques**
- **software (Radiance, Maya...) and research**

Rendering & Lighting Simulation Summary

- *Point lightsource .. Photographs*
- *Radiance approach*
- *IBL idea*
- *Out of standard textbooks .. IBL*
- *Computationally very expensive*
- *http://www.debevec.com*
- *HOT research topic: conference papers*

Reference and Permission

- [Watt00] WATT, A. 2000. *Three-Dimensional Computer Graphics.* Third edition. New York: Addison-Wesley 2000. - Accompanying CD by Pearson Education Ltd. 2000. ISBN 0-201-398559.

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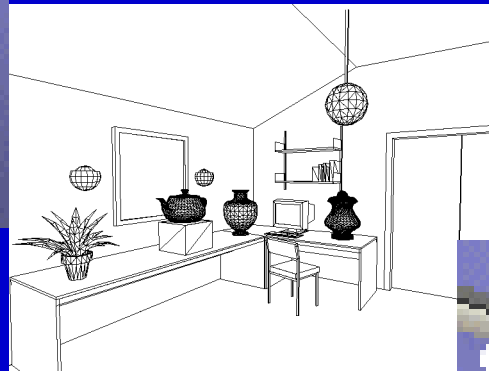
Basic Rendering Options

by A. Watt (2000)

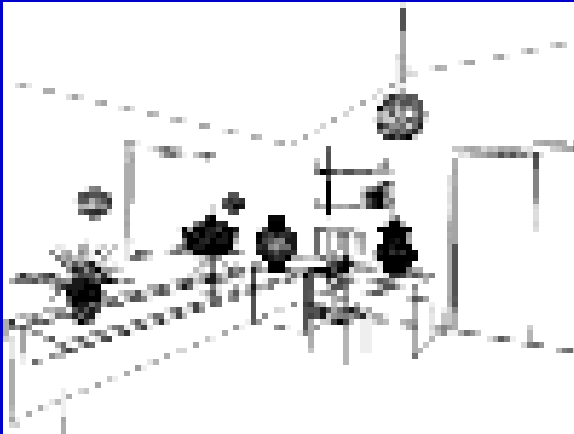*selection and layout A. F. (2002)*

Main Scene

- *Orthographic projection and the nearest perspective view*

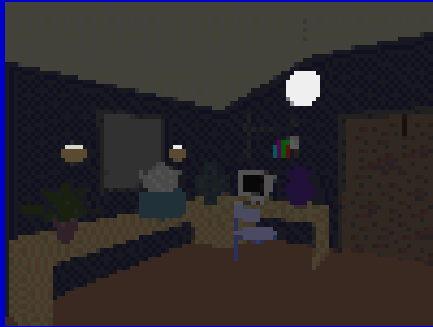# Wireframe, hidden line removal, and hidden line from above

Front and back clip planes, using front clip to see inside geometry
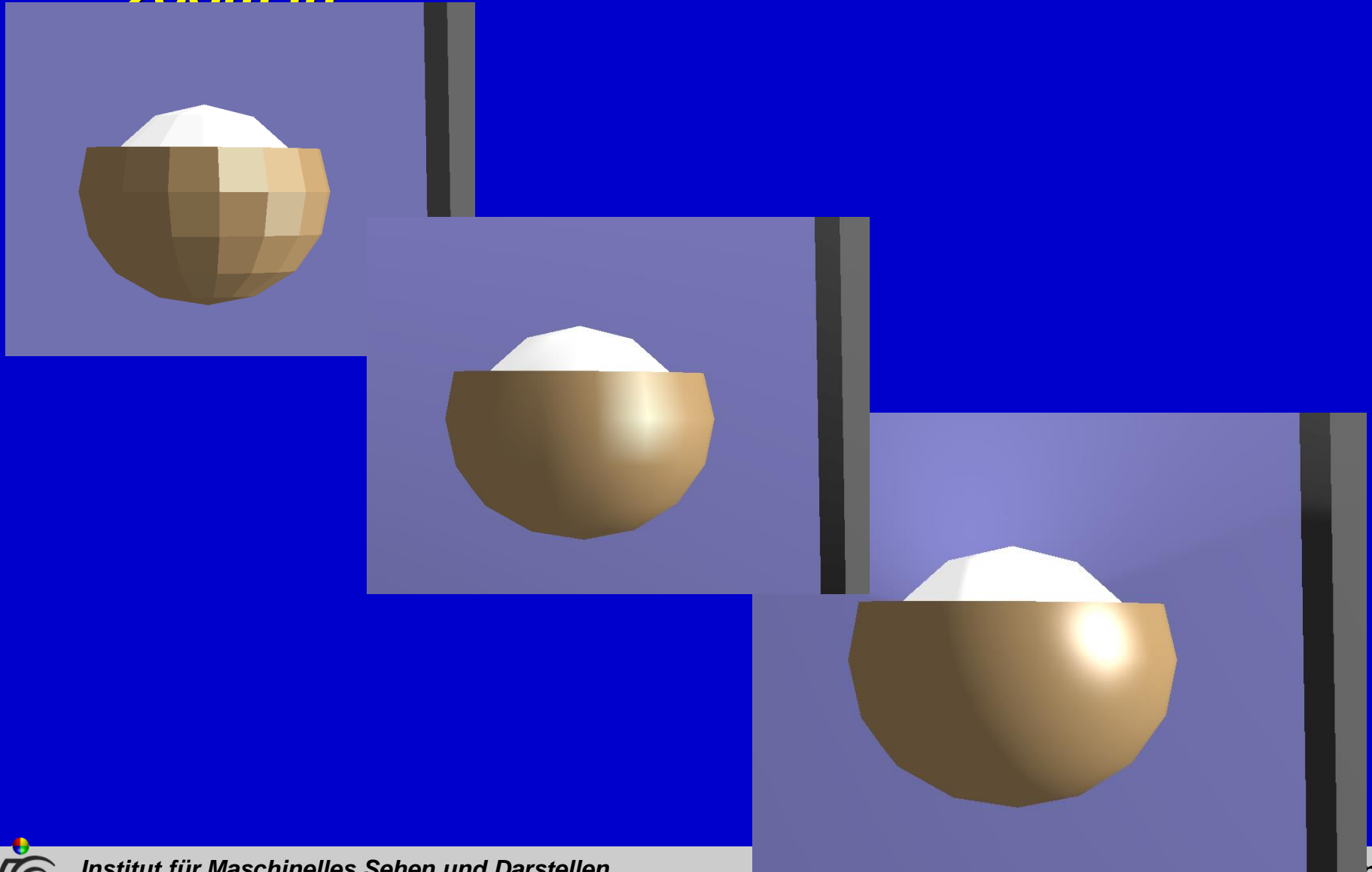
FOV varying from 20 to 160 degrees (8 images)

☐ *__Phong shaded scene: ambient, amb.+diffuse, amb.+diff.+specular__*

Flat, Gouraud, and Phong shaded scene

Flat, Gouraud, and Phong shaded scene - zoom in

Material Realism

by A. Watt (2000)

selection and layout A. F. (2002)

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- ## *Materials used (5*5 array)*

- iron   steel   stainless steel   machine steel   antique brass

- <u>polished brass</u>   copper   bronze   nickel   zinc

- lead   cast aluminiummachined aluminium   magnesium   gold

-

- burnished gold <u>polished gold</u> silver   silver plate   tungsten

- platinum   chromium chromium plate   graphite   mercury

Difference of polished brass & gold ...

... hard to achieve by Phong shading

Thank You…

… for Your attention.

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