Rendering without geometry = IBR

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Dec 14, 2020, *http://www.sccg.sk/ferko/PG1.htm*

Compare Reality vs. Synthesis

Photograph

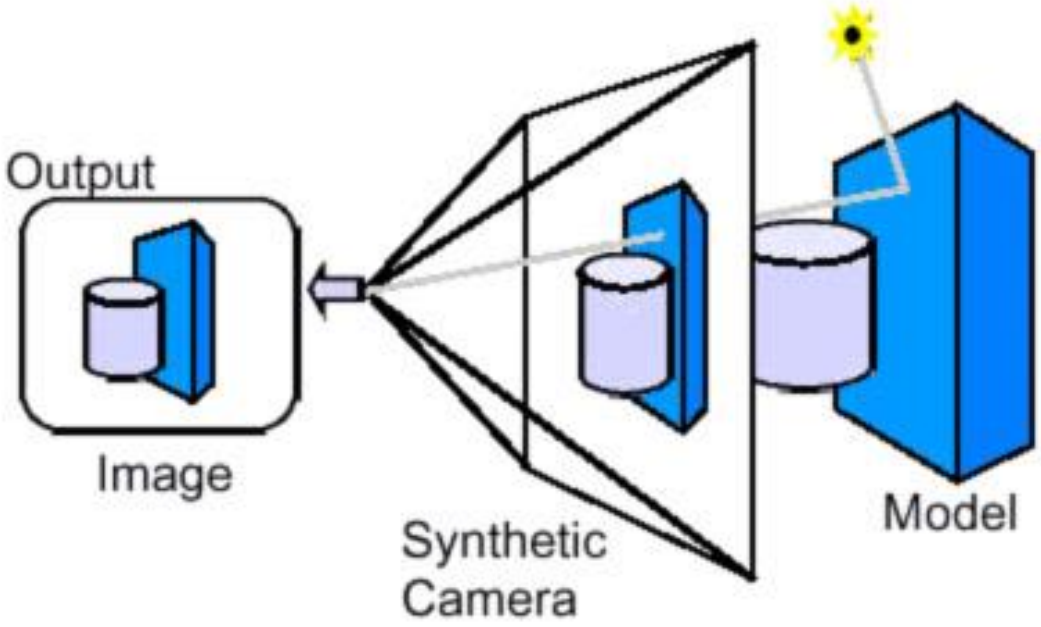
Rendering using the deterministic method

Principles of geometric analysis and synthesis of a mathematic model

- princíp kontinuity
  - (nepreryvnost: spojitost, koherencia)
- princíp zhody
  - (sootvetstvije: dodržiavanie, consistency, conformity)
- princíp kompatibility
  - (sovmestimost: zlucitelnost)

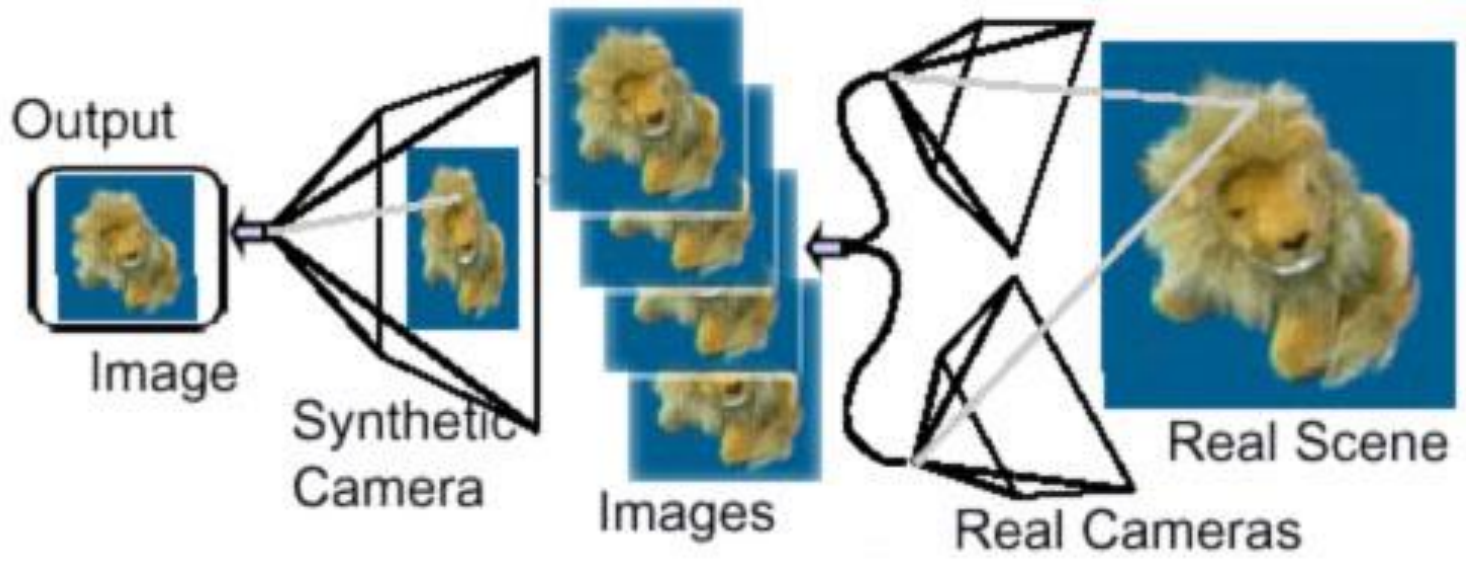
- Baganyan, GA. 1985. Mašinnaja grafika v upravľenii. Jerevan: Ajastan.

Model-Based-Rendering



The real scene built with geometric objects

Image-Based-Rendering



Varied views on real scene combined to the new one

O aplikáciách texturovania by sa dalo pojednávať aj velmi jednoducho, scene graph a VRML

https://hornad.fei.tuke.sk/predmety/svr/doc/SVR_ucebnica_v1.pdf

Použitie textúry v tvare .jpg súboru pomocou uzla *ImageTexture* (Obr. 263):

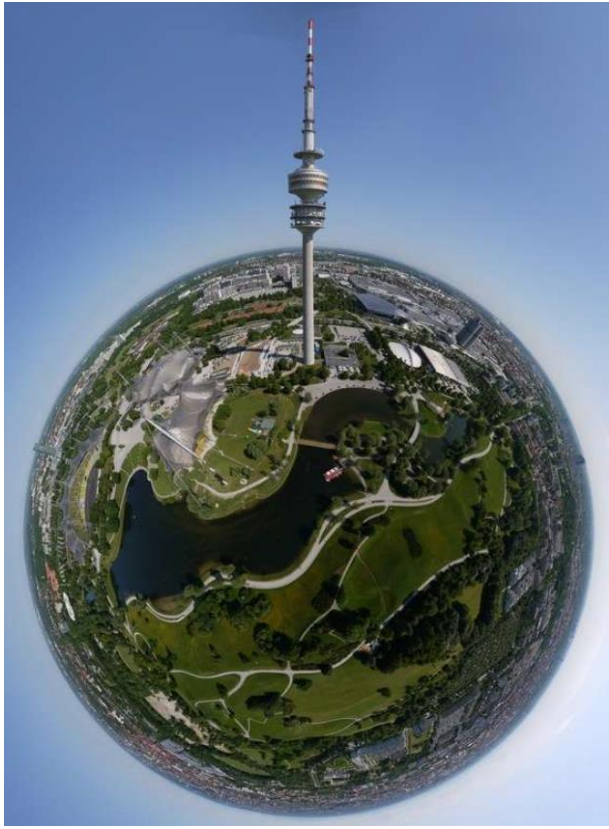
```
#VRML V2.0 utf8
Group {
    children [
    # Vrch plechovky
        Shape {
            appearance Appearance {
                material Material { }
                texture ImageTexture {
                    url "cantop.jpg"
                }
            }
            geometry Cylinder {
                bottom FALSE
                side FALSE
                height 2.7
            }
        }

    # Spodok plechovky
        Shape {
            appearance Appearance {
                material Material { }
                texture ImageTexture {
                    url "canbot.jpg"
                }
            }
            geometry Cylinder {
                top FALSE
                side FALSE
                height 2.7
            }
        }
    # Strany plechovky
        Shape {
```

Obr. 263 Plechovka

Motivation

- Time, costs...
- human visual system
- field of view
- of around 135x200 degrees,
- but a typical camera
- only 35 x 50 degrees...



- Plenoptic modeling... 1995

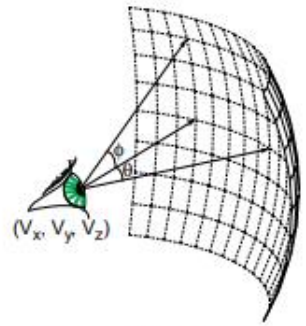


FIGURE 1. The plenoptic function describes all of the image information visible from a particular viewing position.

In the case of a dynamic scene, we can additionally choose the time, t, at which we wish to evaluate the function. This results in the following form for the plenoptic function:

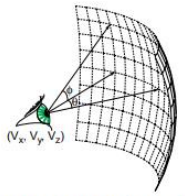
$$p = P(\theta, \phi, \lambda, V_x, V_y, V_z, t) \quad (1)$$

Plenoptic modeling

- **Plenoptic modeling**... Bishop & McMillan 1995
- "Image-based rendering is a powerful new approach for generating real-time photorealistic computer graphics... convincing animations without an explicit geometric representation."

- Tools: Dersch, Hugin, PTGui...

- AutoStitch - Brown-Lowe 2003
- http://matthewalunbrown.com/autostitch/autostitch.html



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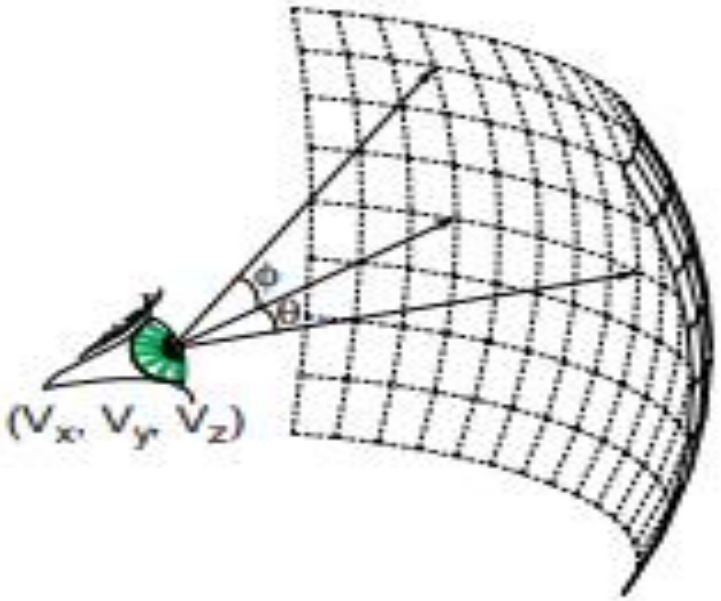
- **7D Plenoptic Function >> 2D panorama**

Plenoptic function [BM95]



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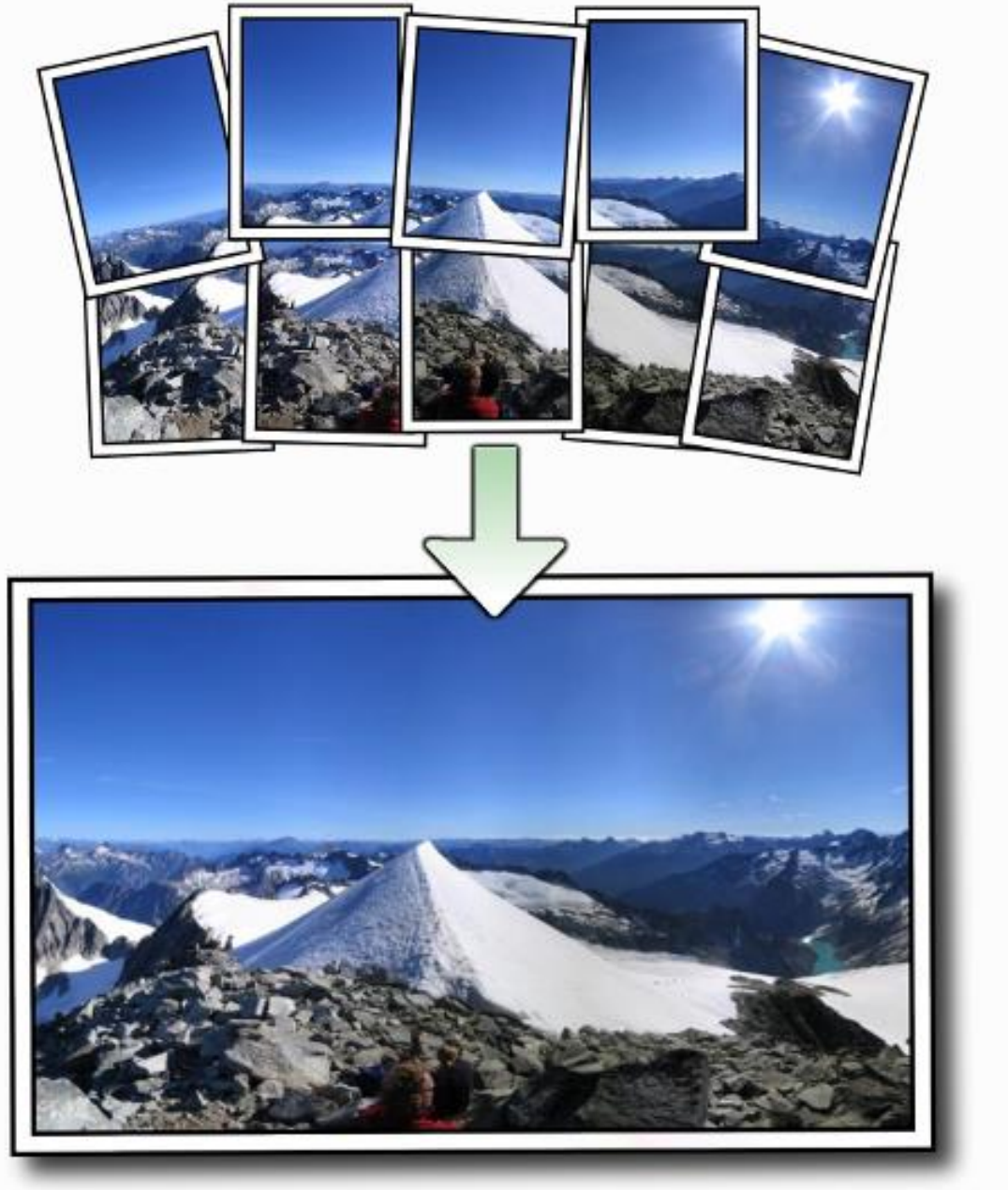
Autostitch

- [BL03]



Process

- [BL03]

25 of 57 images aligned

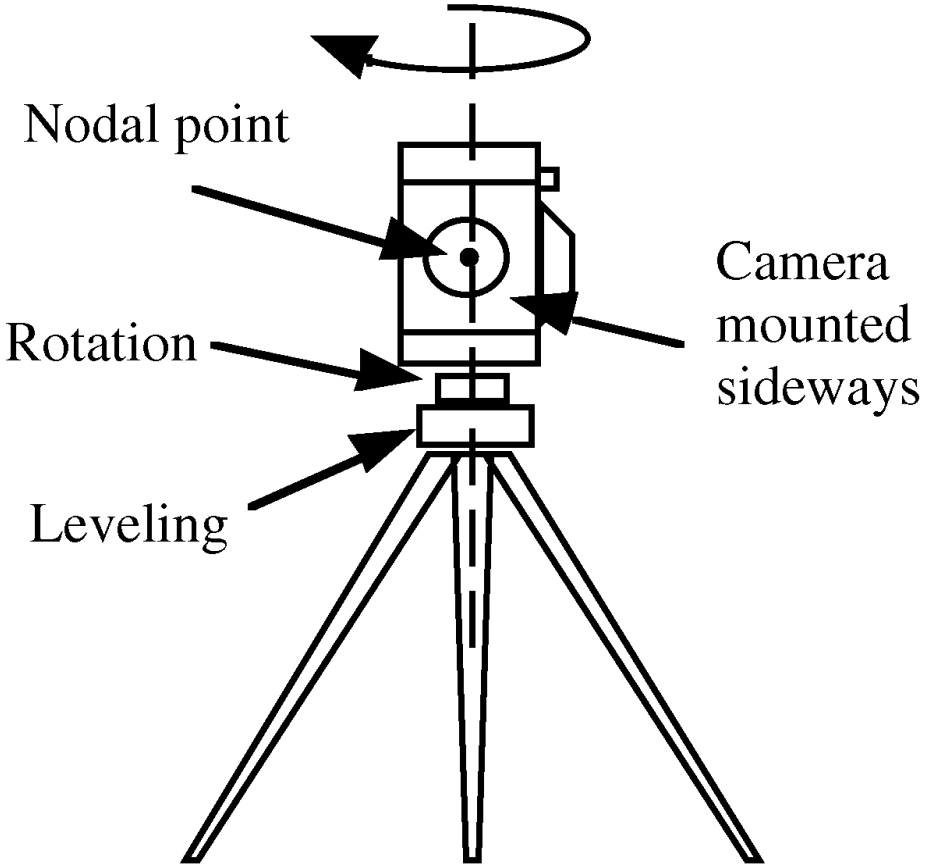
All 57 images aligned

Final Result

- http://matthewalunbrown.com/autostitch/autostitch.html

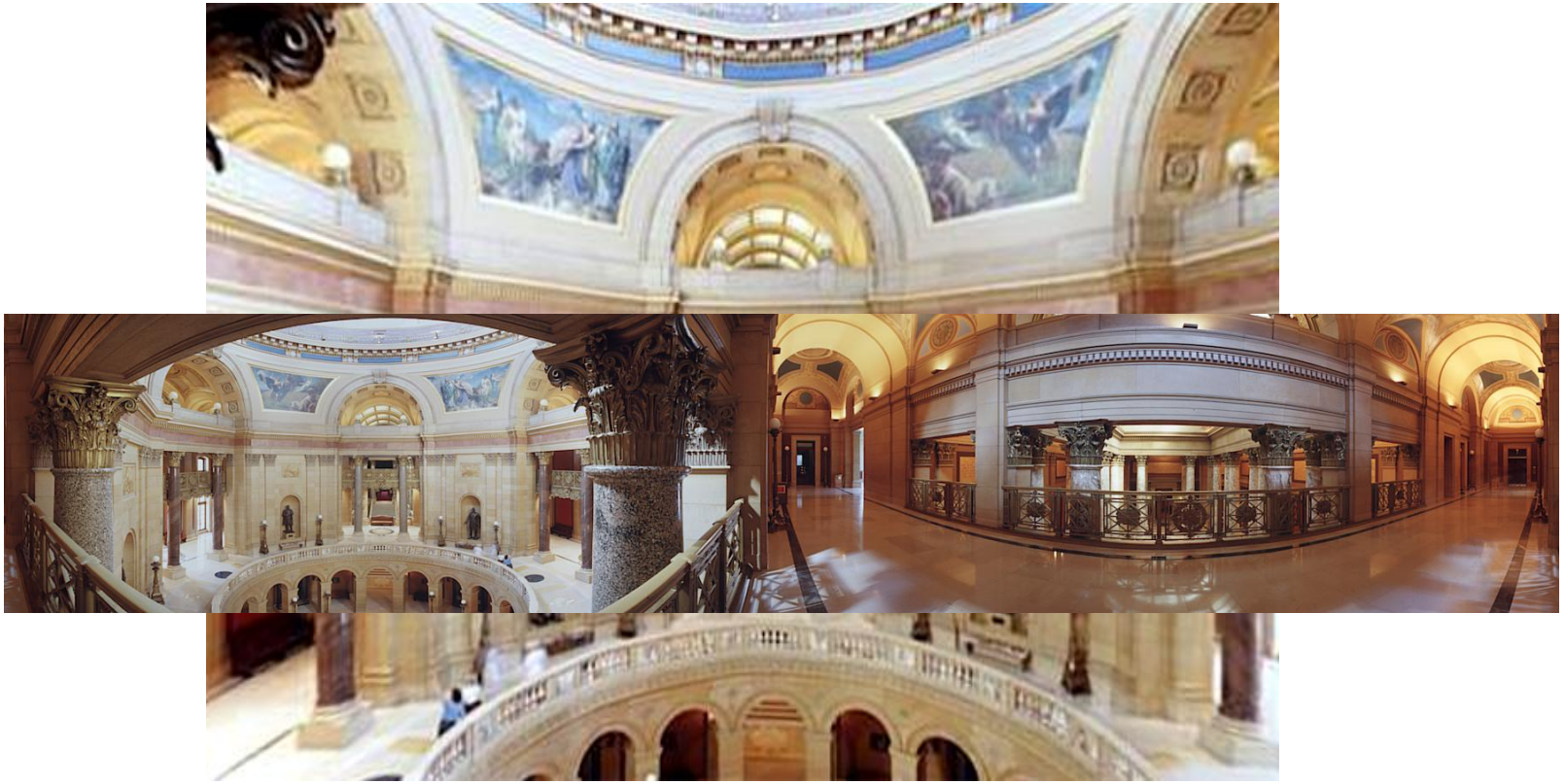
Recording Systems

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



- Panoramas from
- exponed positions

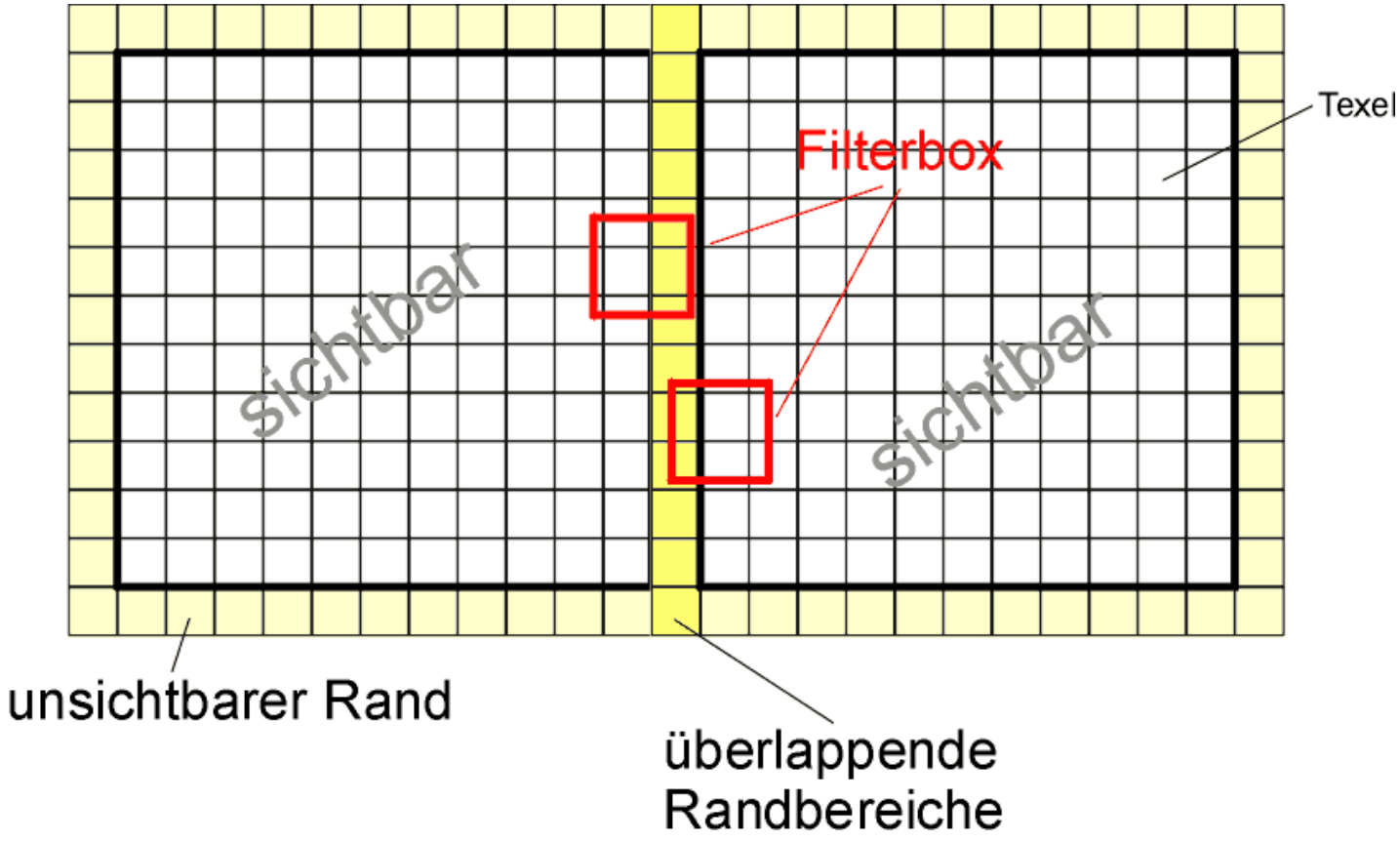
From Panoramic Images to Image Synthesis



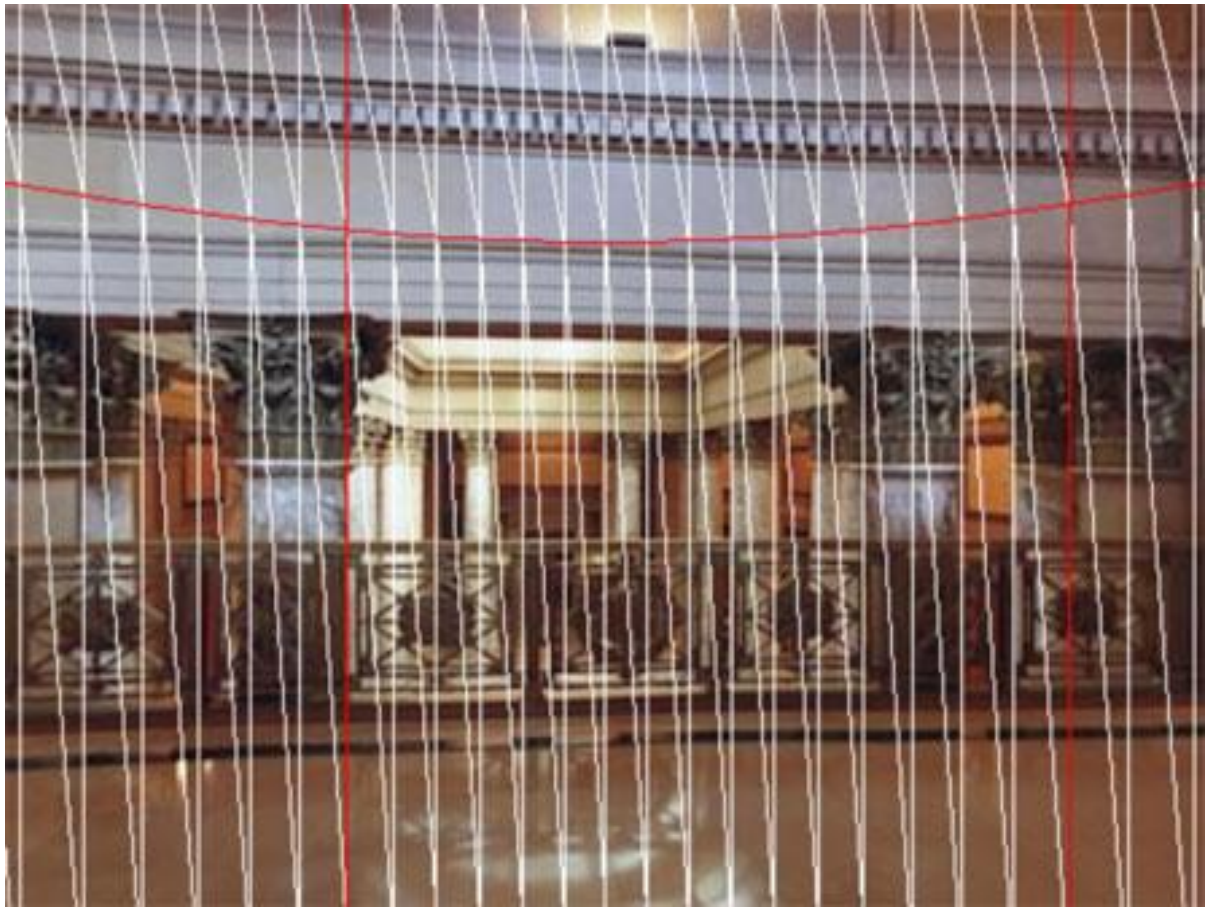
Functionality

- 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



Results



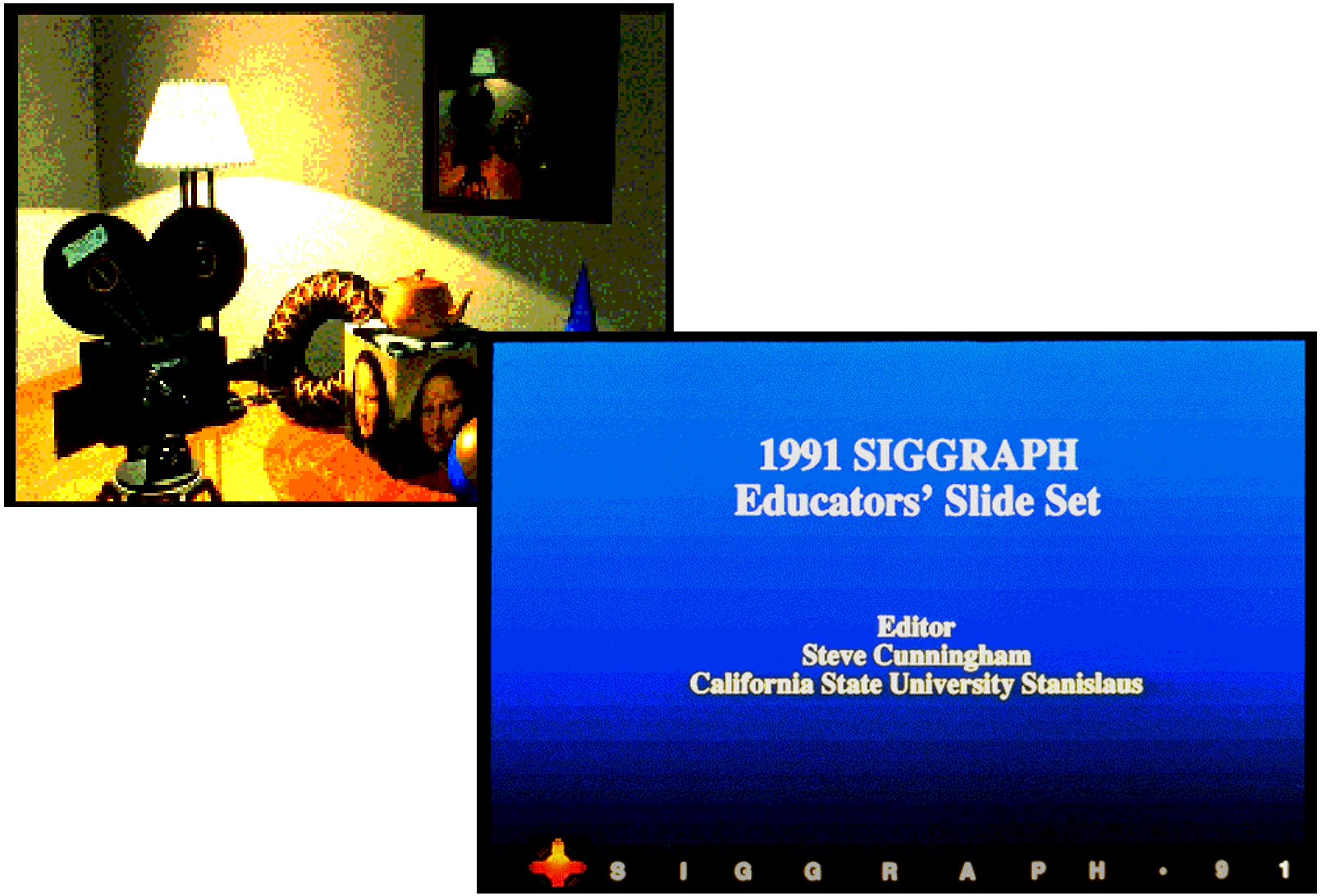
View straightened out

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

SIGGRAPH Slide Show

- 

ShutterBug Credits

Produced by Tom Williams and H. B. Siegel, with the assistance of M. W. Mantle

All images rendered with PhotoRealistic RenderMan 3.2

Copyright Pixar, 1990

Produced for Computer Graphics, Principles and Practice, Second Edition, by Foley, van Dam, Feiner, and Hughes

Copyright Addison-Wesley, 1990

S I G G R A P H • 9

The Shutterbug Rendering Progression

This sequence illustrates the progressive refinement of rendering algorithms.

The images range from wire frames to photo-realistic renditions including reflections and shadows.

The rendering algorithm affects the quality and information conveyed by the image, independent of the underlying three-dimensional model.

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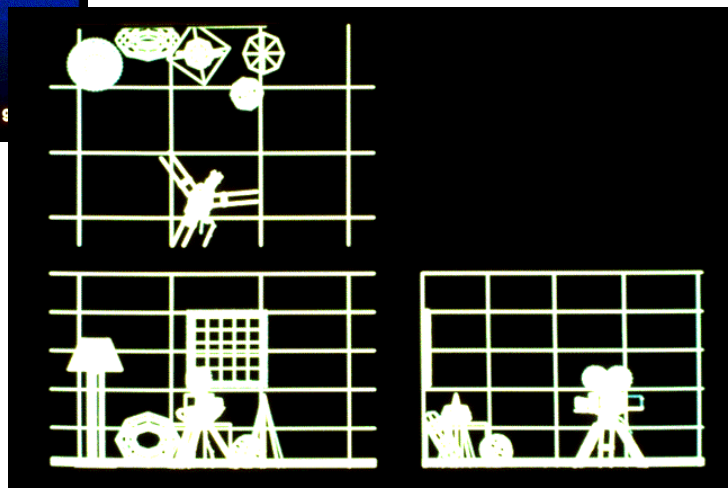
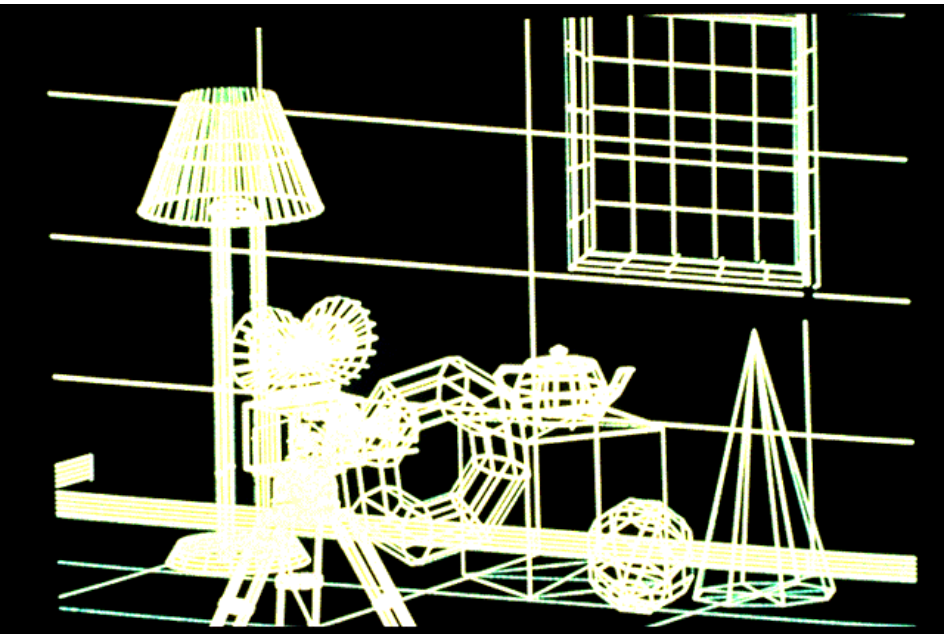
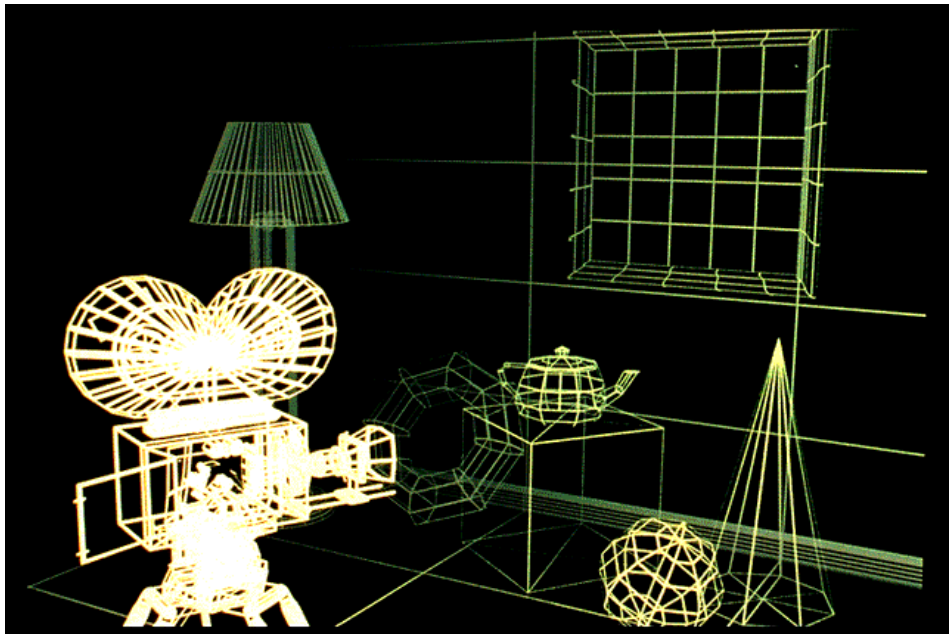
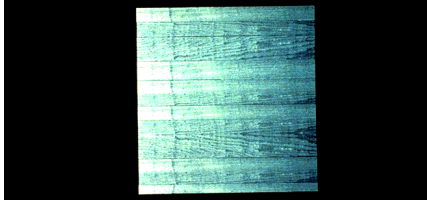
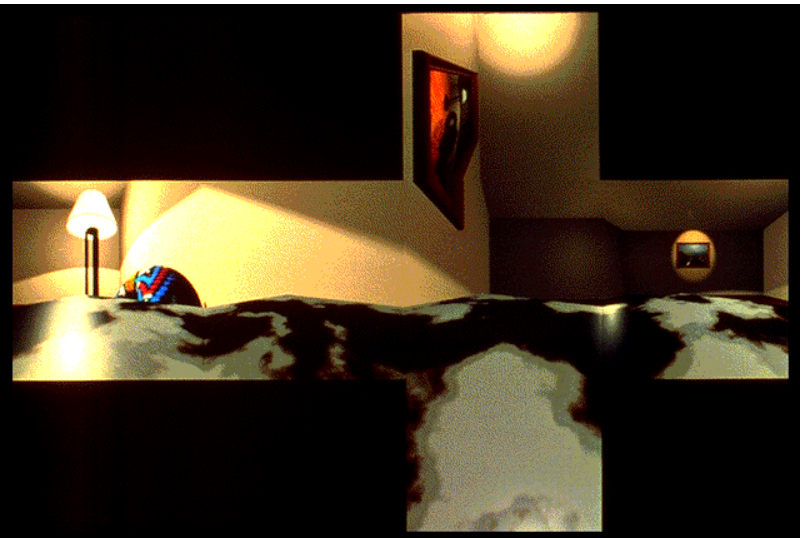
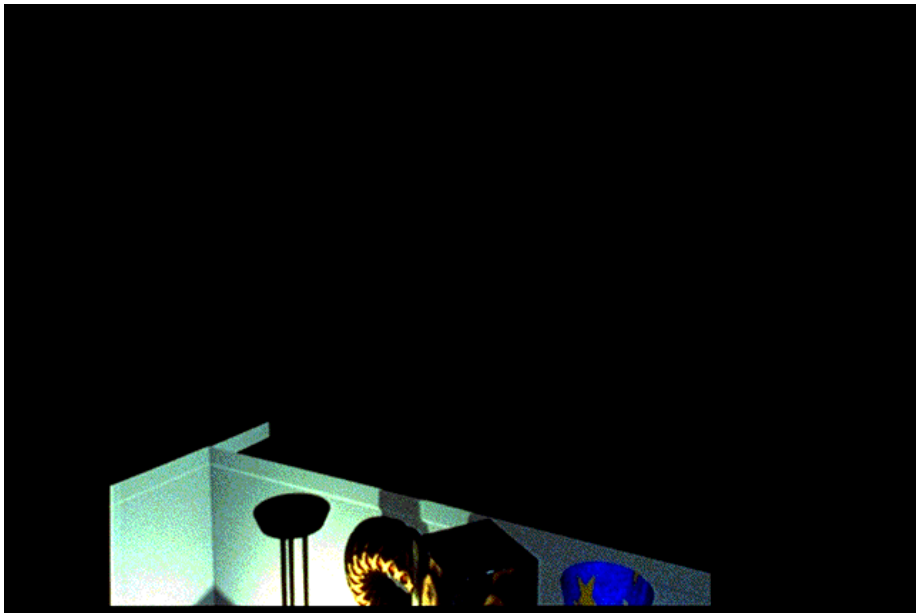












Compare Workflow (PTGui)

Photograph

Rendering using the deterministic method

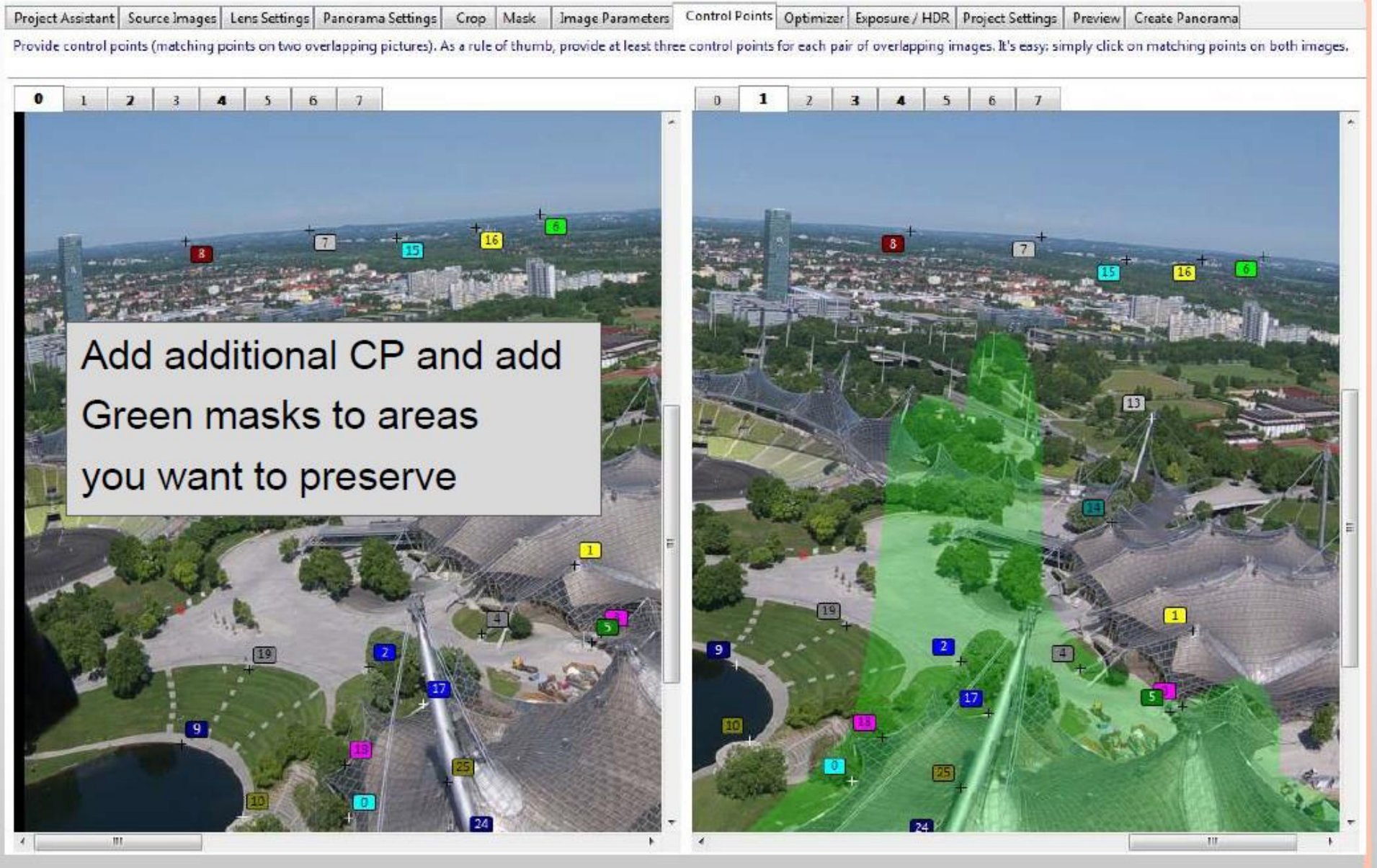
Stitching Workflow using PtGui

- Load the 5 aerial pictures into PtGui
- Assuming RAW images have been processed with LR

	Image	File	Width	Height
0		R:\Pano\Kopter\Olympiapark\P1050983.JPG	4000	3000
1		R:\Pano\Kopter\Olympiapark\P1050985.JPG	4000	3000
2		R:\Pano\Kopter\Olympiapark\P1050987.JPG	4000	3000
3		R:\Pano\Kopter\Olympiapark\P1050989.JPG	4000	3000
4		R:\Pano\Kopter\Olympiapark\P1050992.JPG	4000	3000

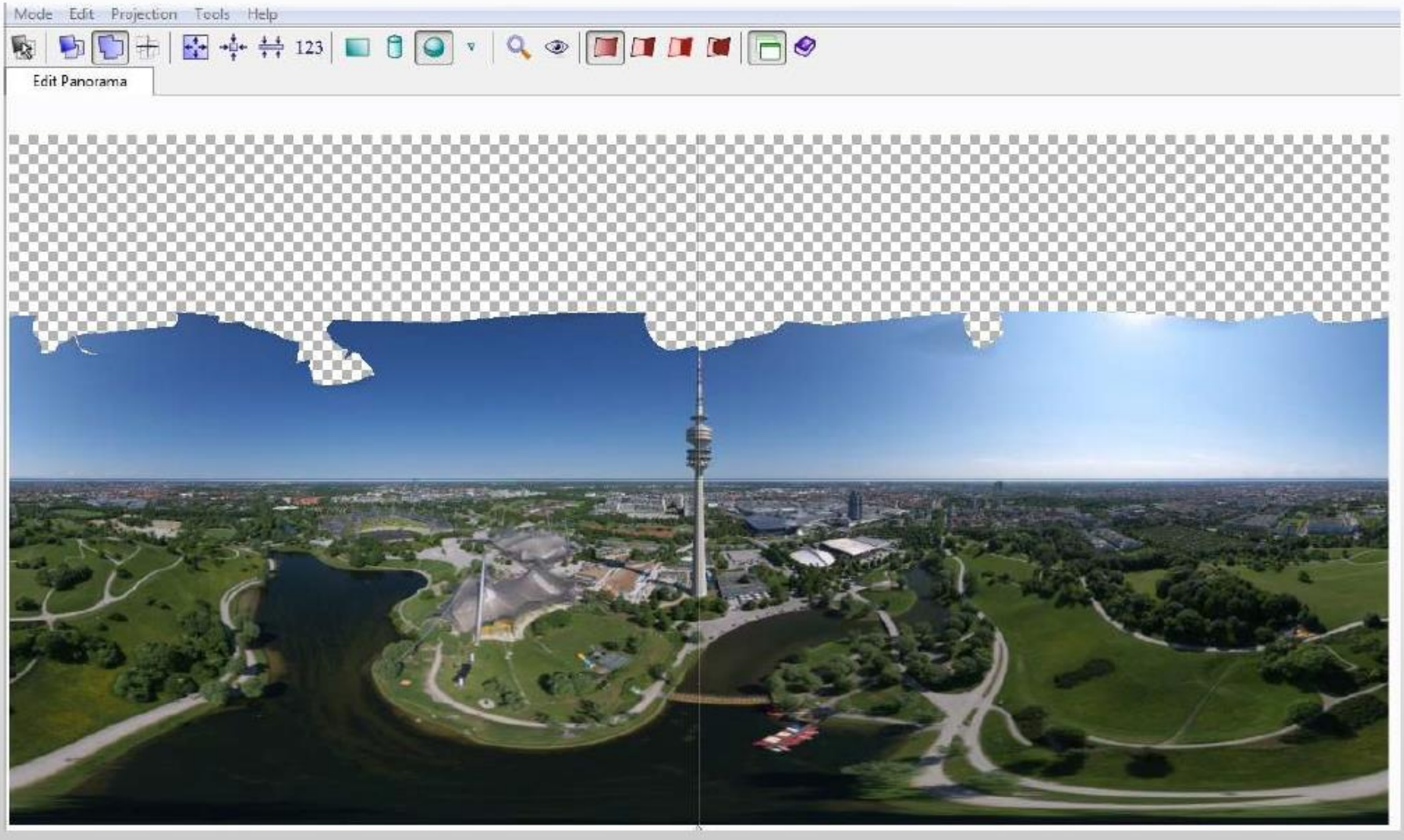
STITCHING WORKFLOW USING PTGUI

STITCHING WORKFLOW USING PTGUI

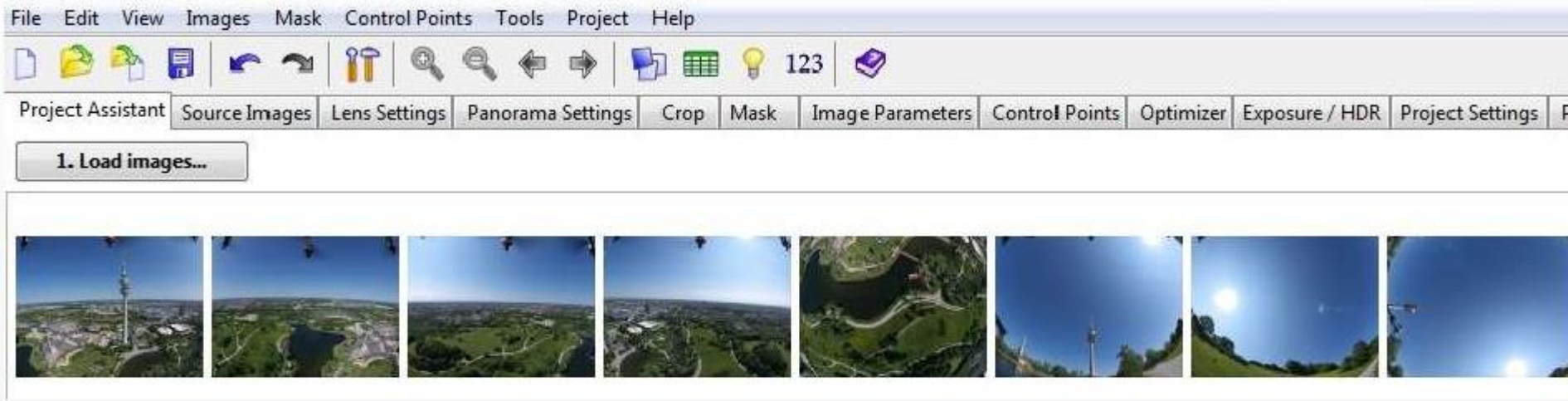


STITCHING WORKFLOW USING PTGUI

Align and optimize the spherical panorama



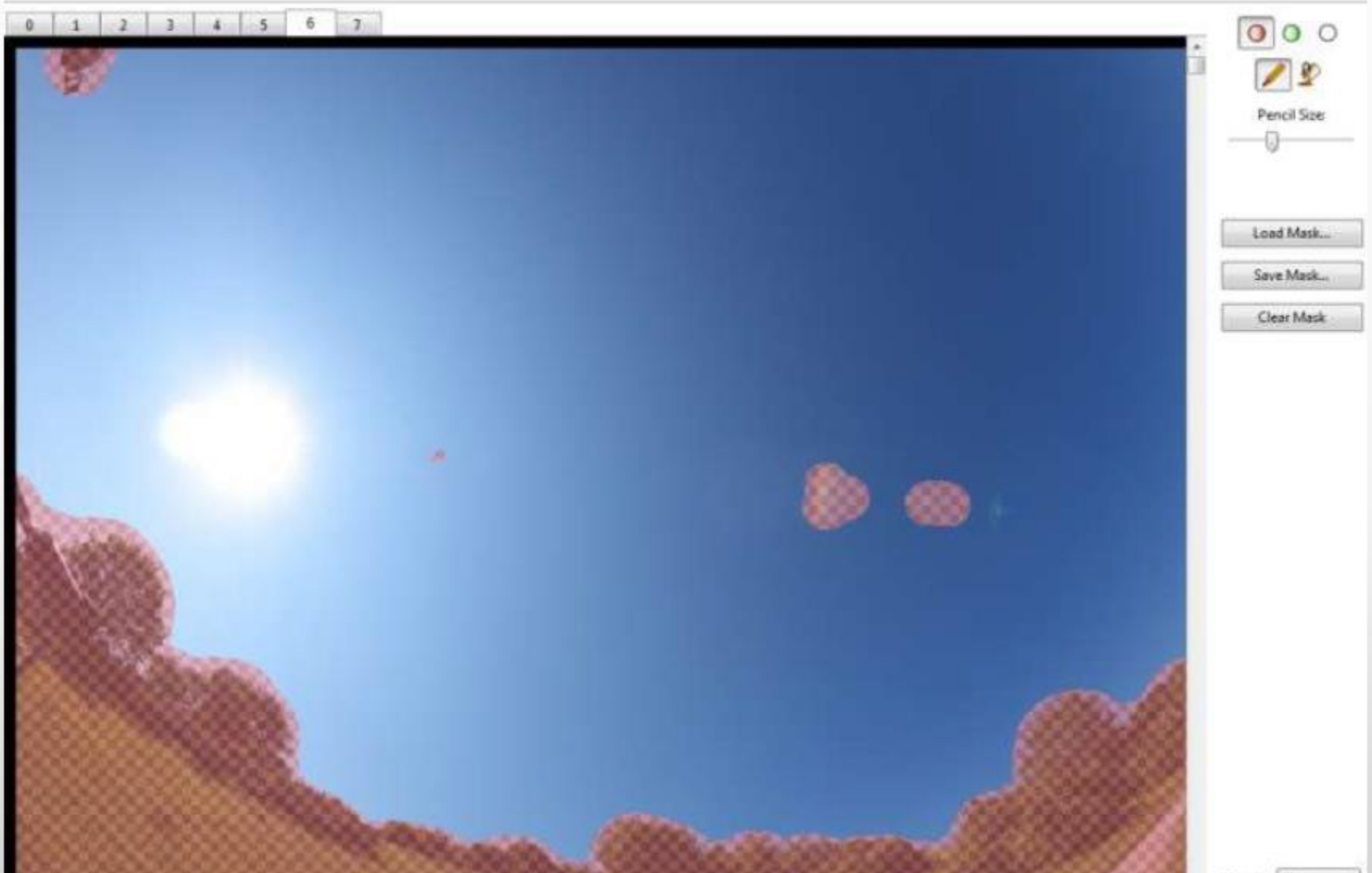
STITCHING WORKFLOW USING PTGUI



- Add 3 Zenith pictures
  - Advantage of having enough overlap to remove lens flares and ground objects
- Move the 3 pictures manually using the panorama editor into the ‘right’ position

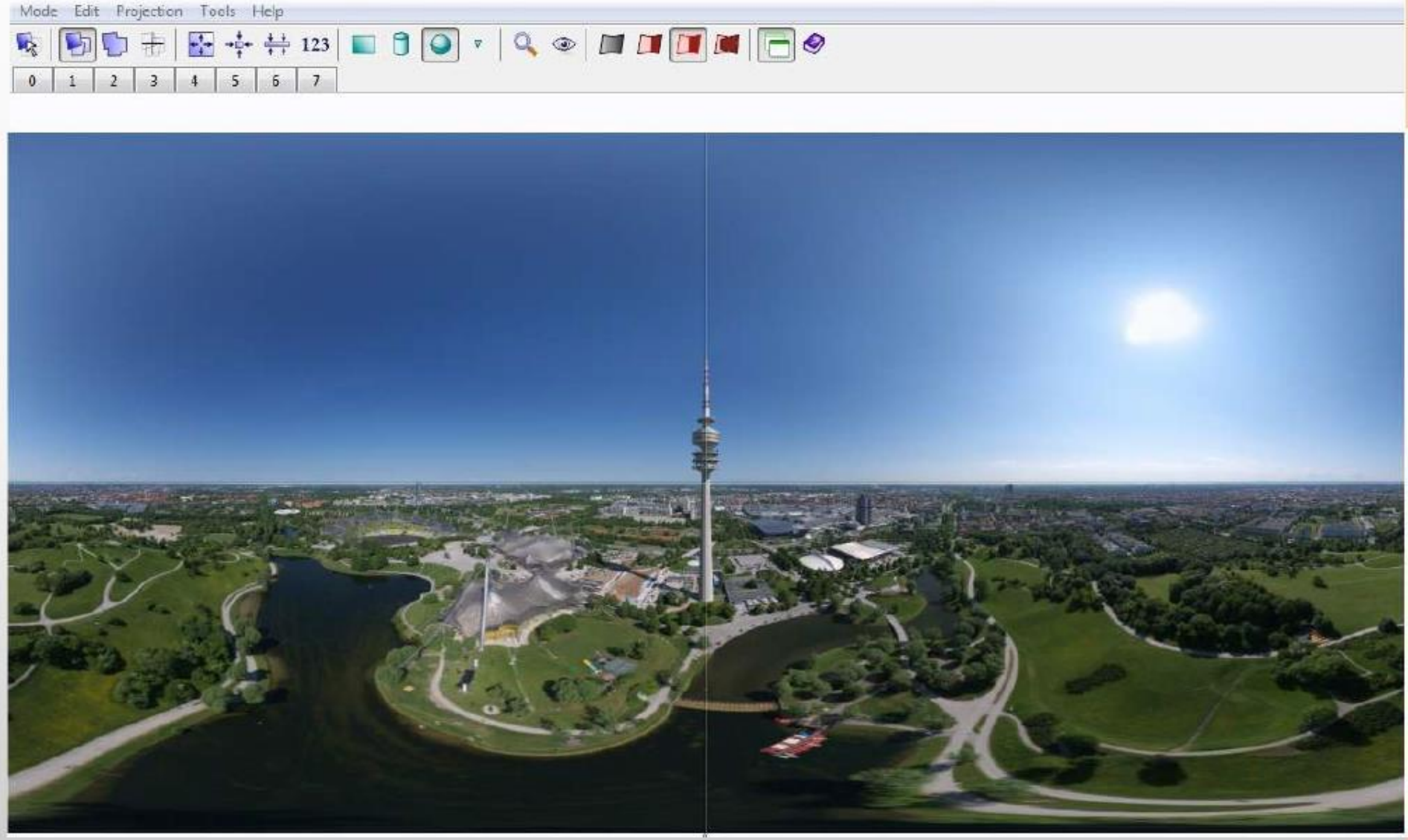
Stitching Workflow using PTGui

- Mask ground objects and lens flares



STITCHING WORKFLOW USING PTGUI

- Check the panorama in Editor



Compare Workflow (PTGui)

Photograph

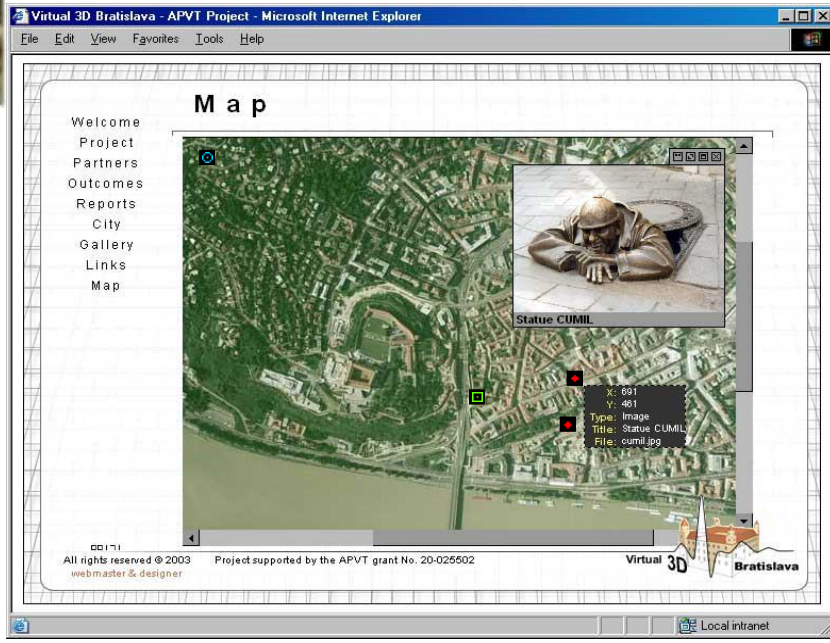
Rendering using the deterministic method

History before computers

- Panorama of 'Old Edinburgh' by Robert Barker
- Barker's patent for painting panoramas expired in 1801, which meant the 360-degree images could be produced by rival artists

is Panorama of 'Old Edinburgh' by Robert Barker is still in existance and resides at the The Edinburgh Virtual Environment Centre, University of Edinburgh. The Panorama was as wide as 300 feet and as high as 50. It is known as "Edinburgh From The Crown Of St. Giles". Image Copyright © City Arts Centre.

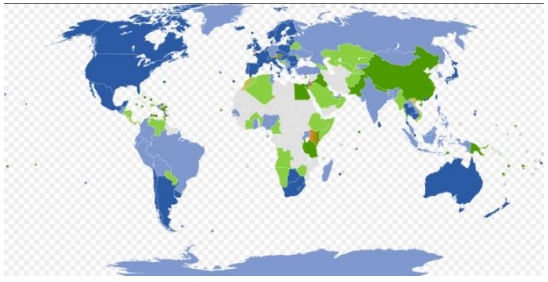
History 2, Bratislava



Veduta, malovana rovinna panorama a dvojpohladova vizualizacia, VrBa.

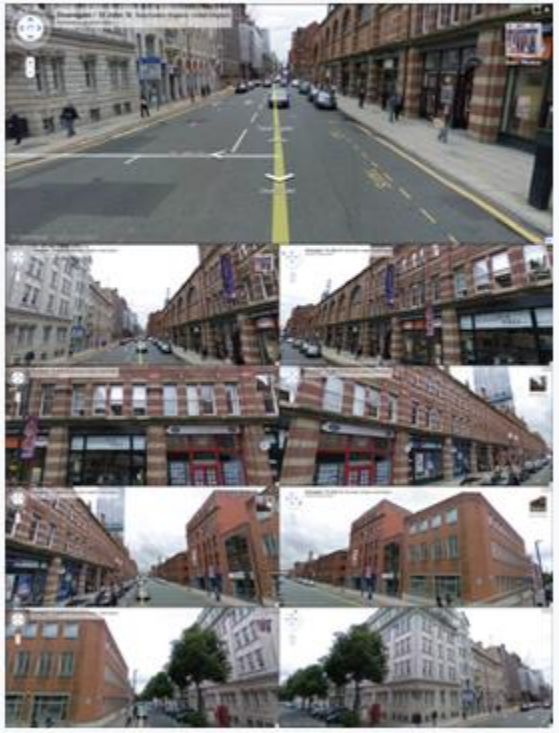
History 3… Street View 2007

The facades of buildings were texture-mapped onto 3D models. The same 3D model was used to translate 2D screen coordinates into a database of buildings in order to provide hyperlinks to additional data.



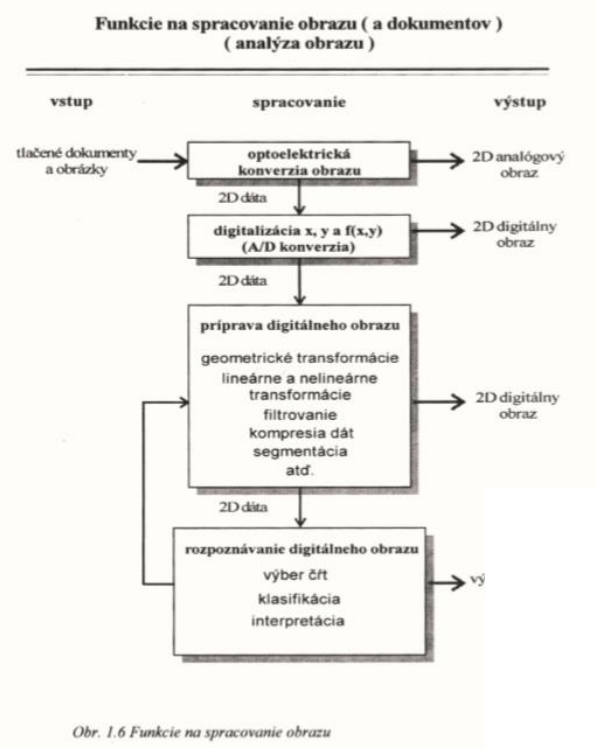
Aspen Movie Map, MBR >> IBR, 20 peta 2012

Google Street View

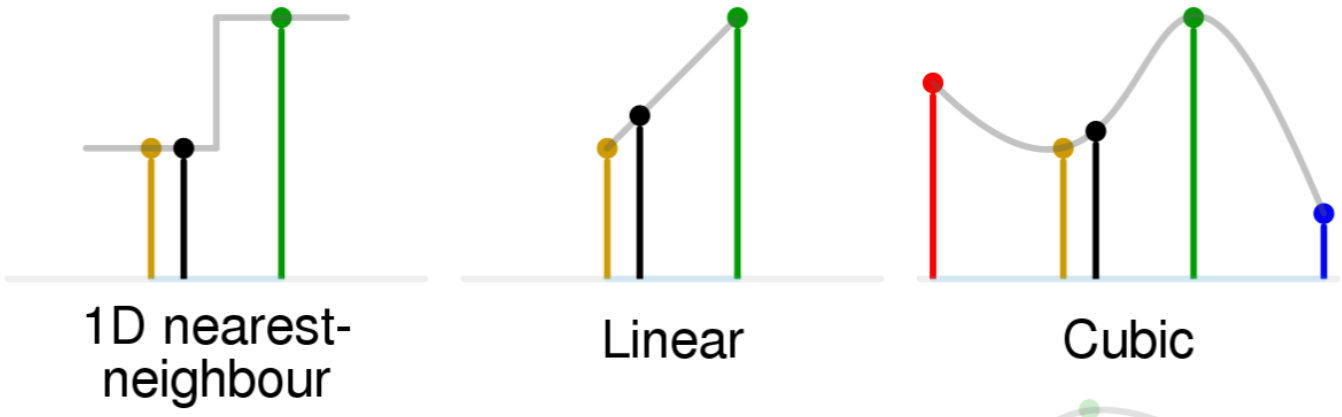


A road junction in Manchester, England, showing nine different angles

Initial release May 25, 2007; 10 years ago



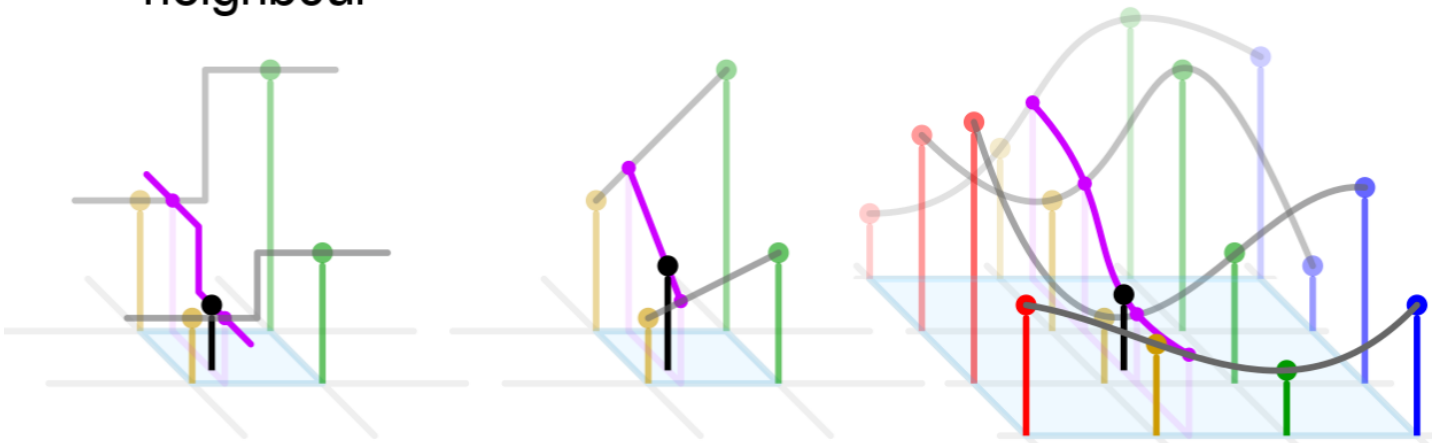
Obr. 1.6 Funkcie na spracovanie obrazu



1D nearest-neighbour

Linear

Cubic



2D nearest-neighbour

Bilinear

Bicubic

Rendering without geometry = IBR

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