



Rendering without geometry = IBR

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

Compare Reality vs. Synthesis



Photograph

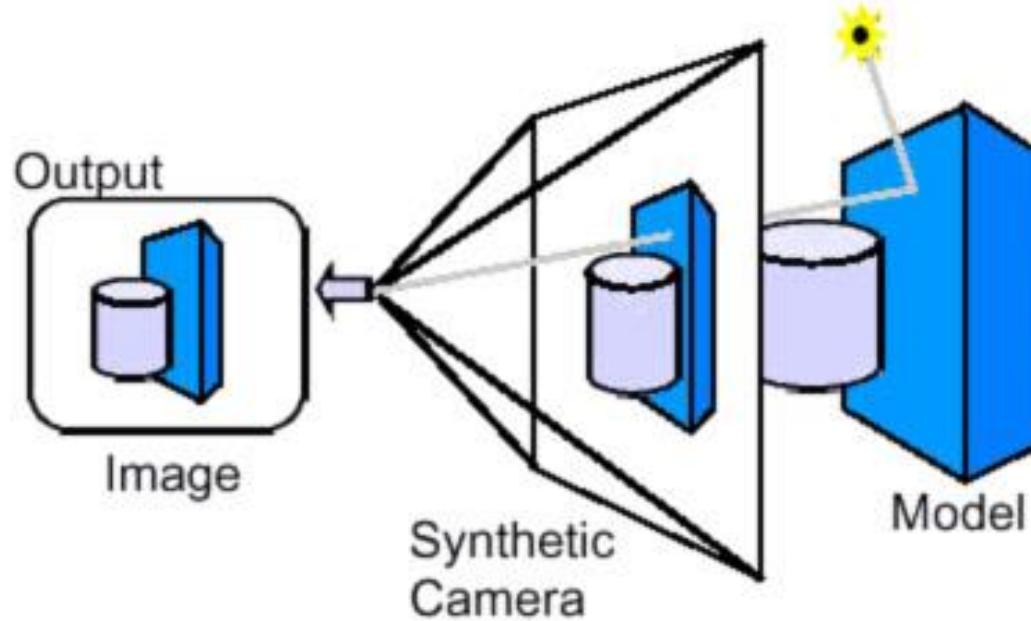


Rendering using the deterministic method

Principles of geometric analysis and synthesis of a mathematic model

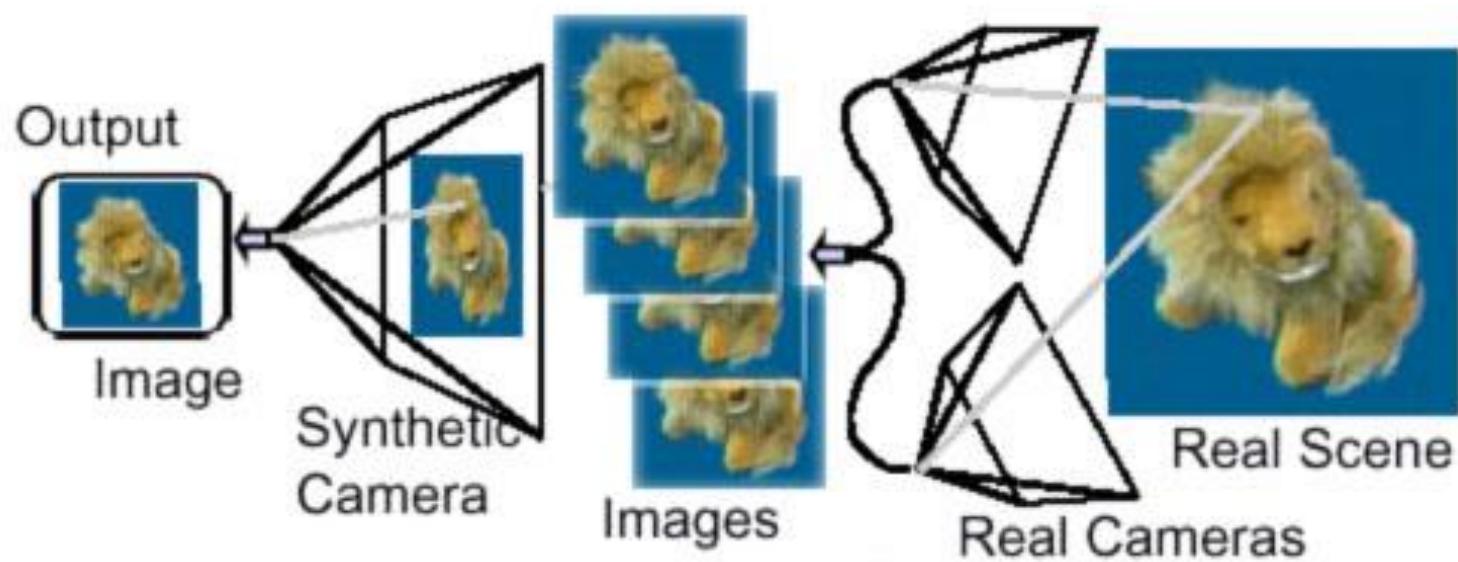
- princíp kontinuity
 - (nepreryvnost: spojitosť, koherencia)
- princíp zhody
 - (sootvetstvije: dodržiavanie, consistency, conformity)
- princíp kompatibility
 - (sovместимост: zlucitelnost)
- Baganyan, GA. 1985. Mašinnaja grafika v upravlenii. Jerevan: Ajastan.

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

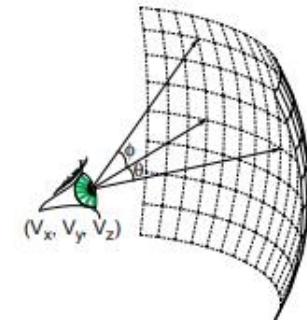


FIGURE 1. The plenoptic function describes all of the image information visible from a particular viewing position.

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>

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

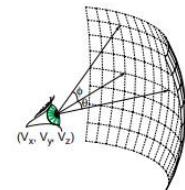


FIGURE 1. The plenoptic function describes all of the image information visible from a particular viewing position.

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Plenoptic function [BM95]

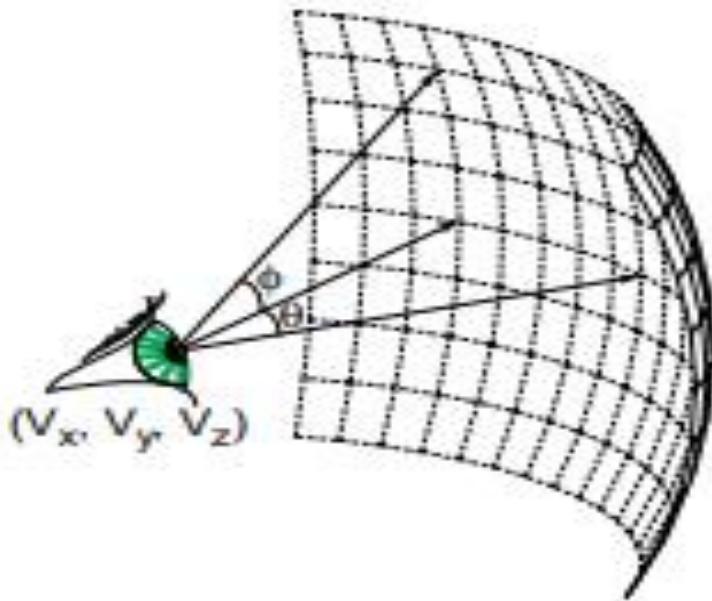


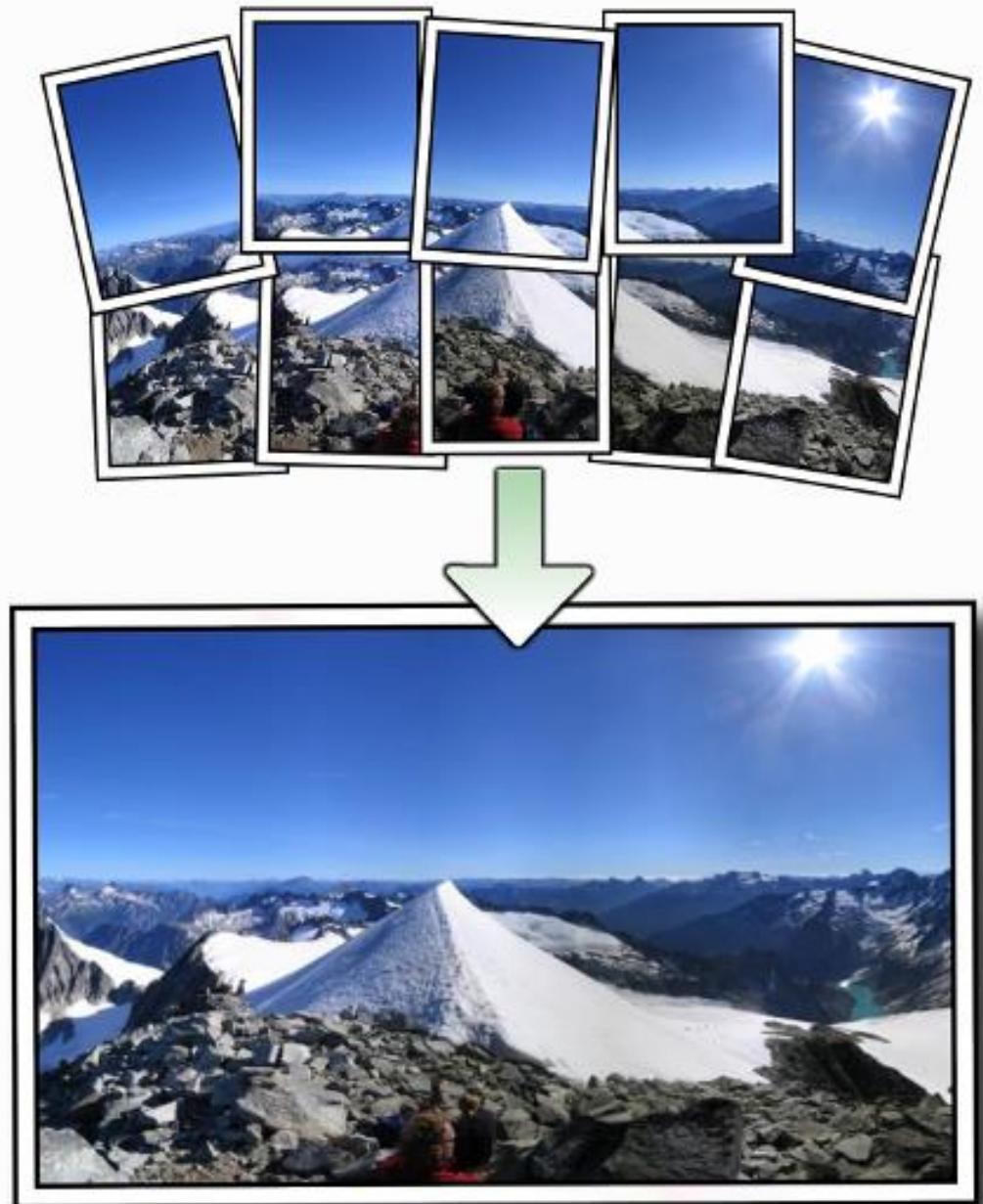
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Autostitch

- [BL03]



Process

- [BL03]



25 of 57 images aligned



All 57 images aligned

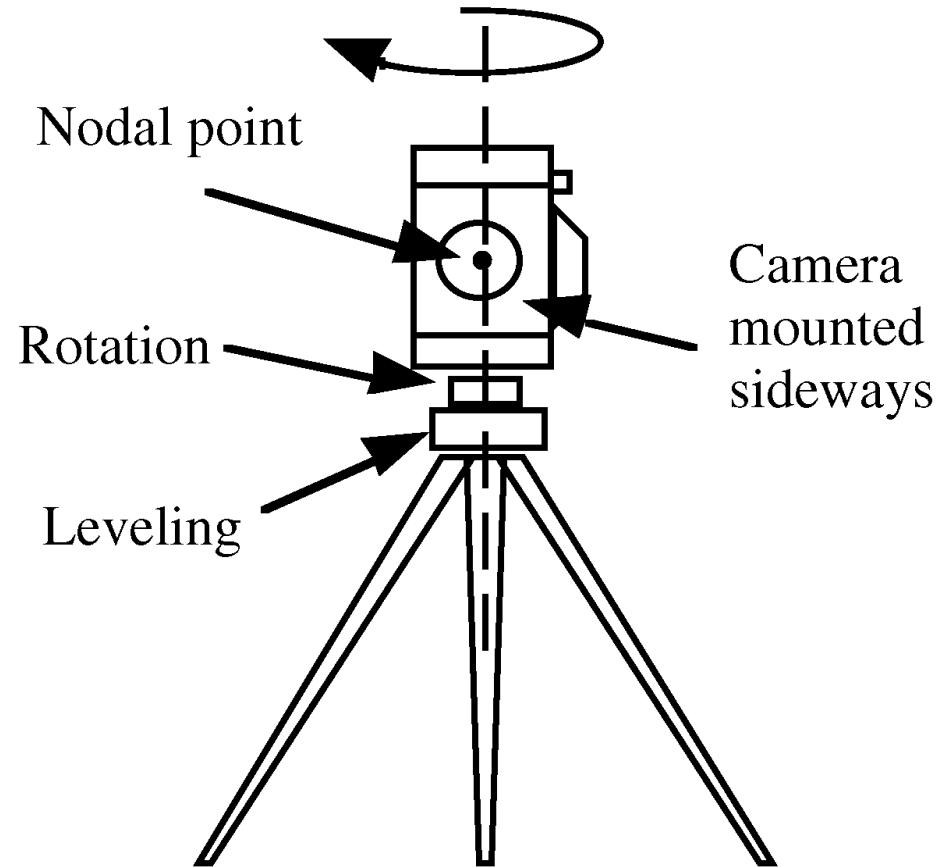


Final Result

- <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

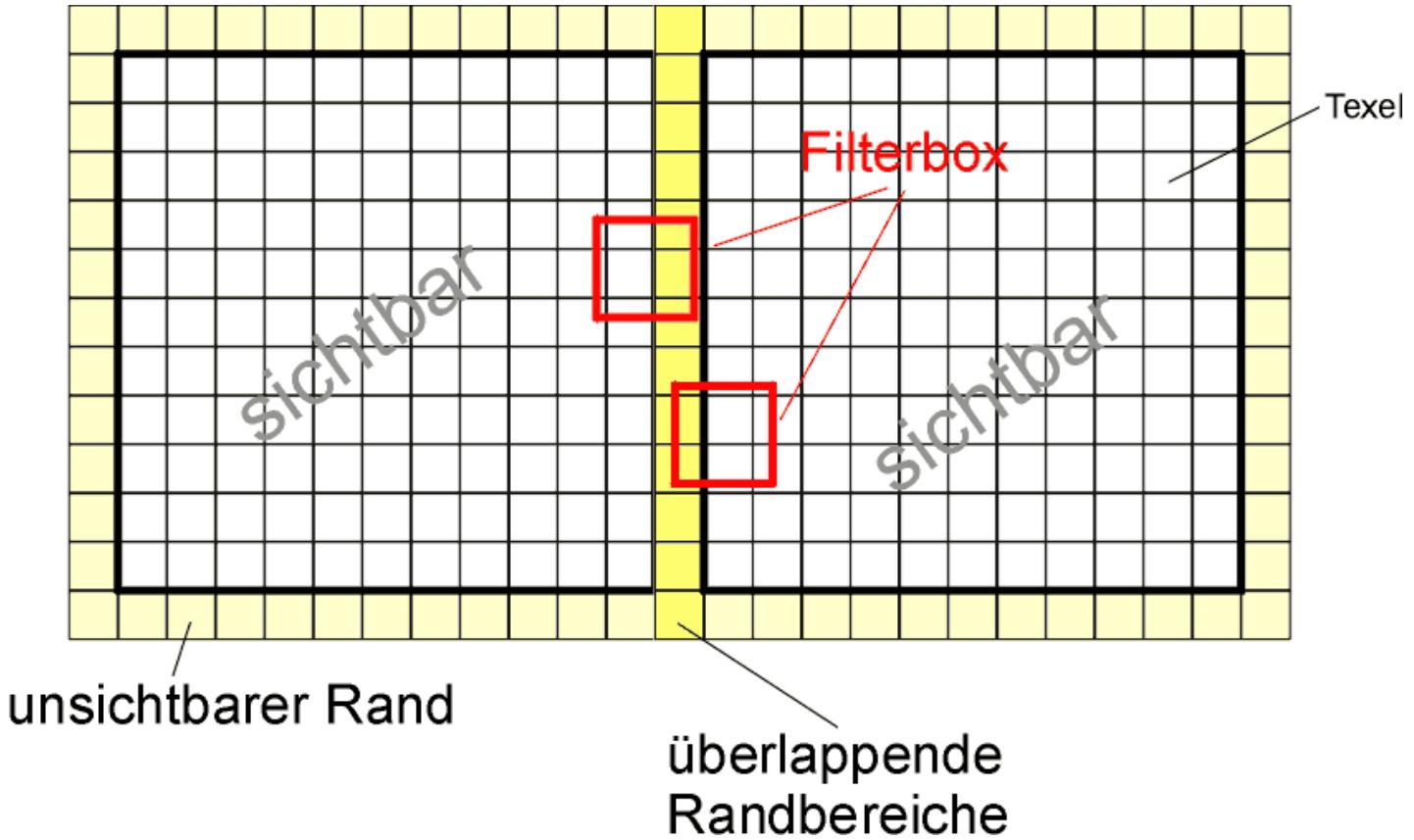


ZYSSOERBKJLHDTWZLJYKJGJLHJLH

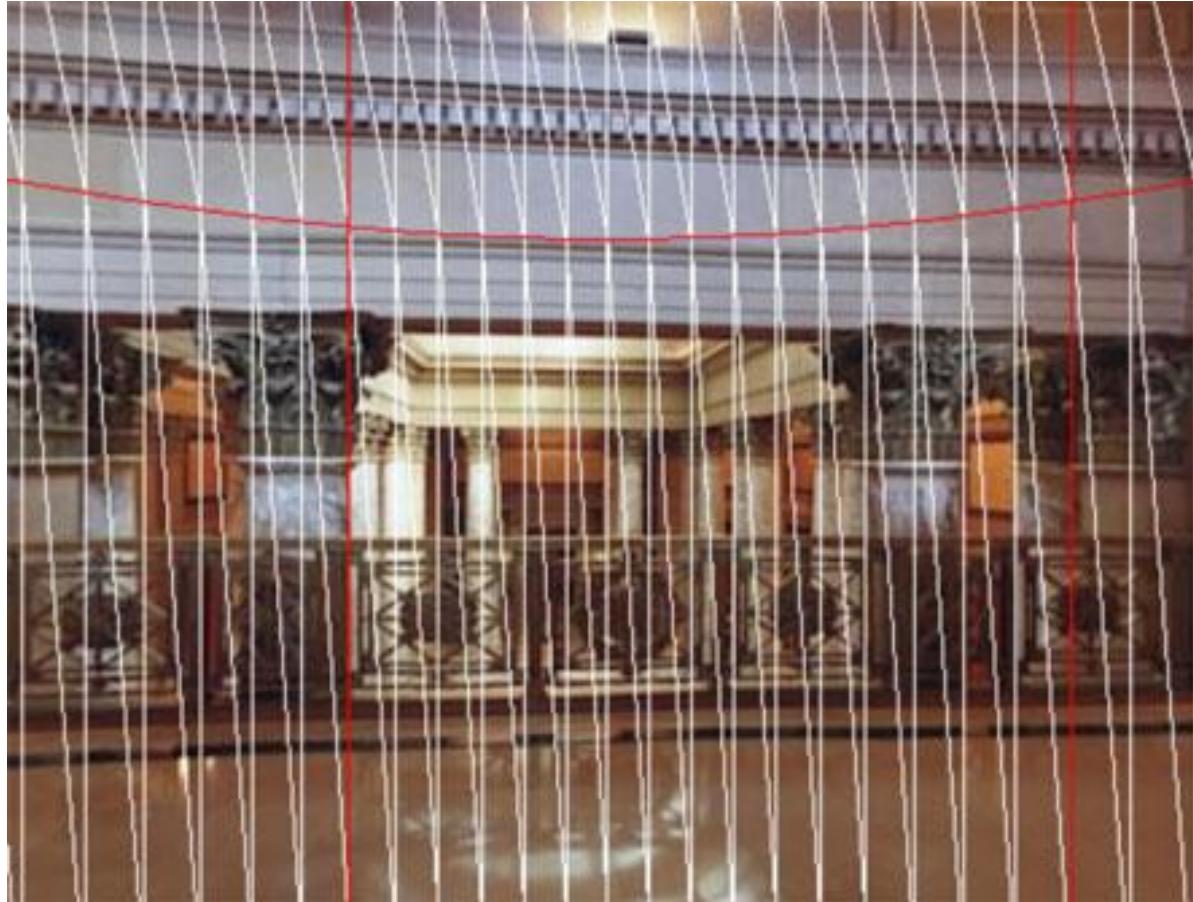
Functionality

- 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



1991 SIGGRAPH Educators' Slide Set

Editor
Steve Cunningham
California State University Stanislaus



S I G R A P H • 9 1

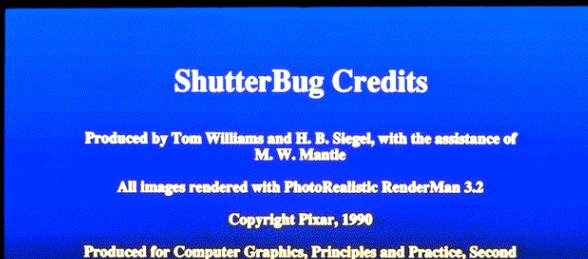
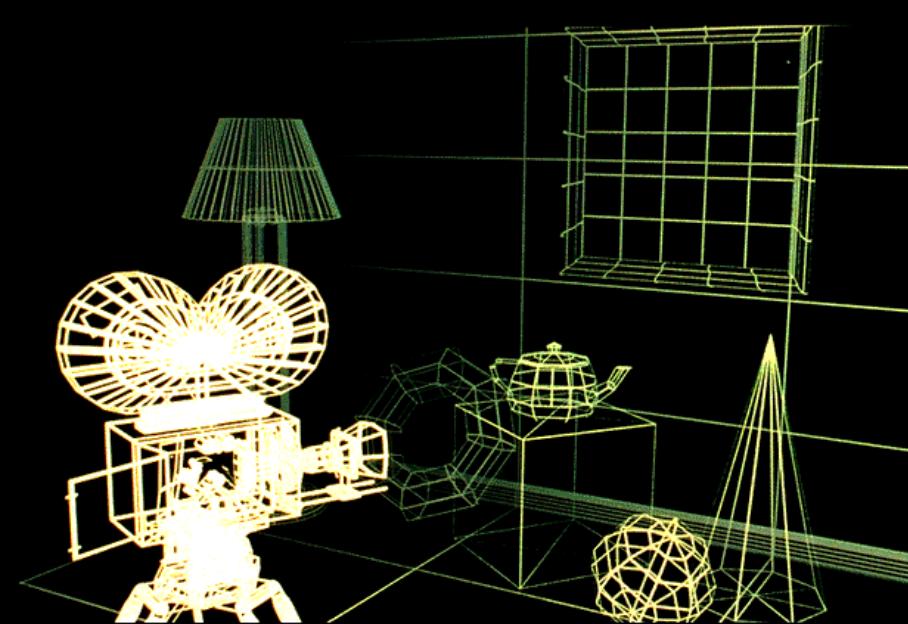
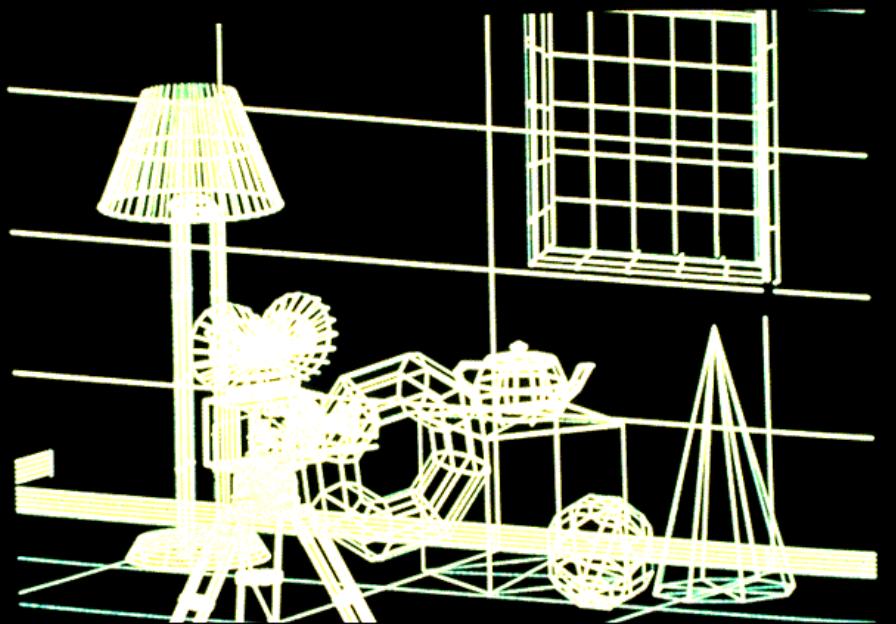
The Shutterbug Rendering Progression

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.

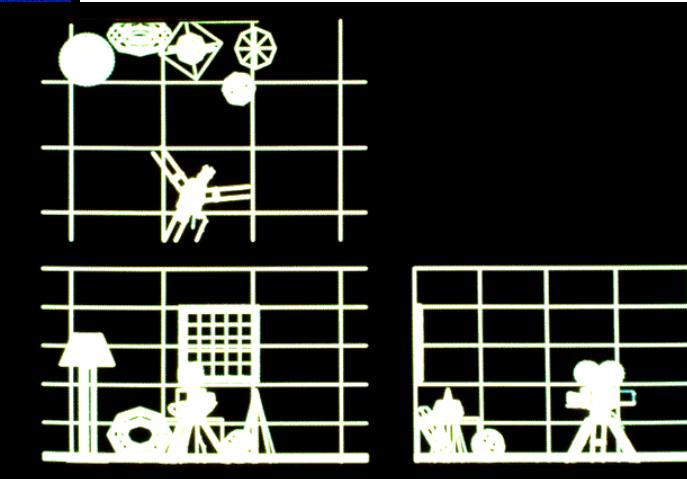
S I G G R A P H • 9 1

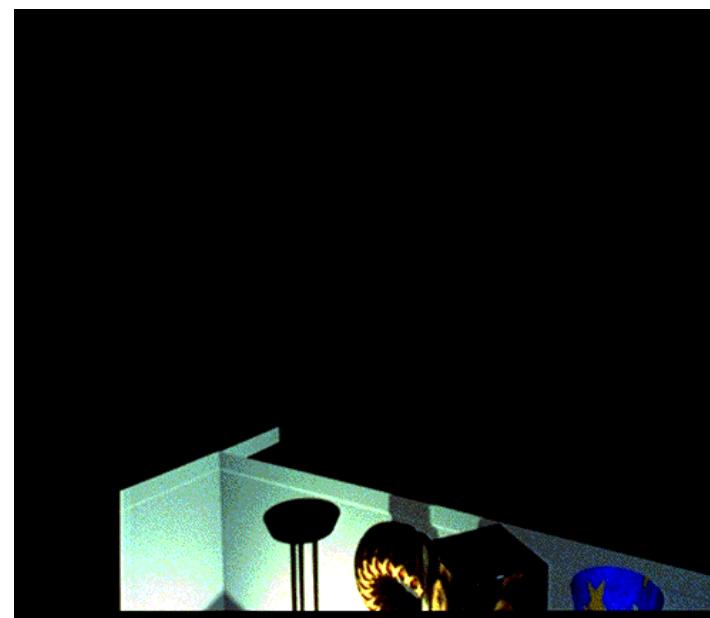
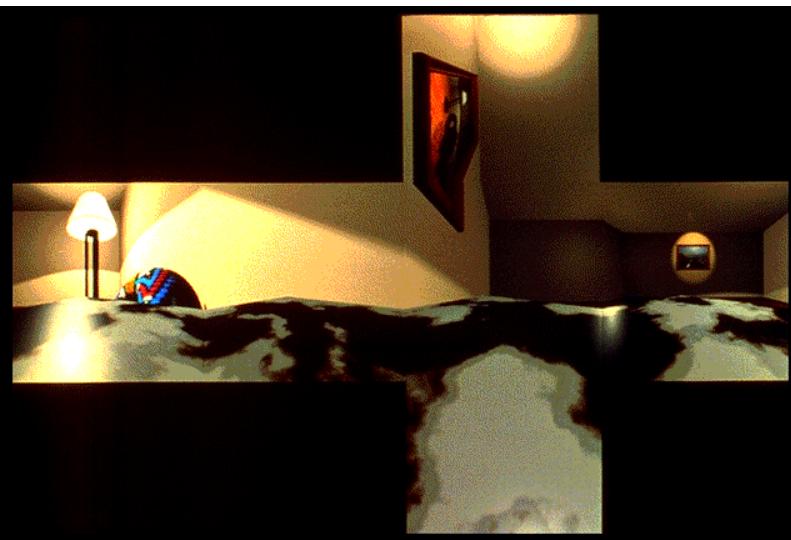
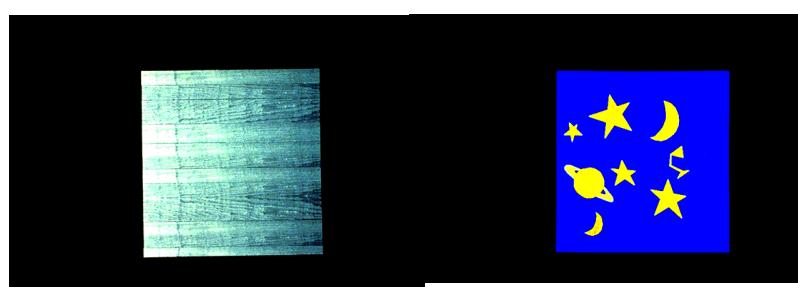


Produced for Computer Graphics, Principles and Practice, Second
Edition, by Foley, van Dam, Feiner, and Hughes

Copyright Addison-Wesley, 1990

S I G G R A P H • 9 1





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

Project Assistant Source Images Lens Settings Panorama Settings Crop Mask Image Parameters Control Points Optimizer Exposure / HDR Project Settings Preview Create Panorama

Here you can hide unwanted parts of your source images by coloring them red. Or paint green to force certain parts to appear in the blended panorama.

0 1 2 3 4 5 6 7

Use Mask to remove objects like motor and propeller

Pencil Size:

Load Mask... Save Mask... Clear Mask

Zoom: Fit

D A C

STITCHING WORKFLOW USING PTGUI

Project Assistant | Source Images | Lens Settings | Panorama Settings | Crop | Mask | Image Parameters | Control Points | Optimizer | Exposure / HDR | Project Settings | Preview | Create Panorama

Provide control points (matching points on two overlapping pictures). As a rule of thumb, provide at least three control points for each pair of overlapping images. It's easy; simply click on matching points on both images.

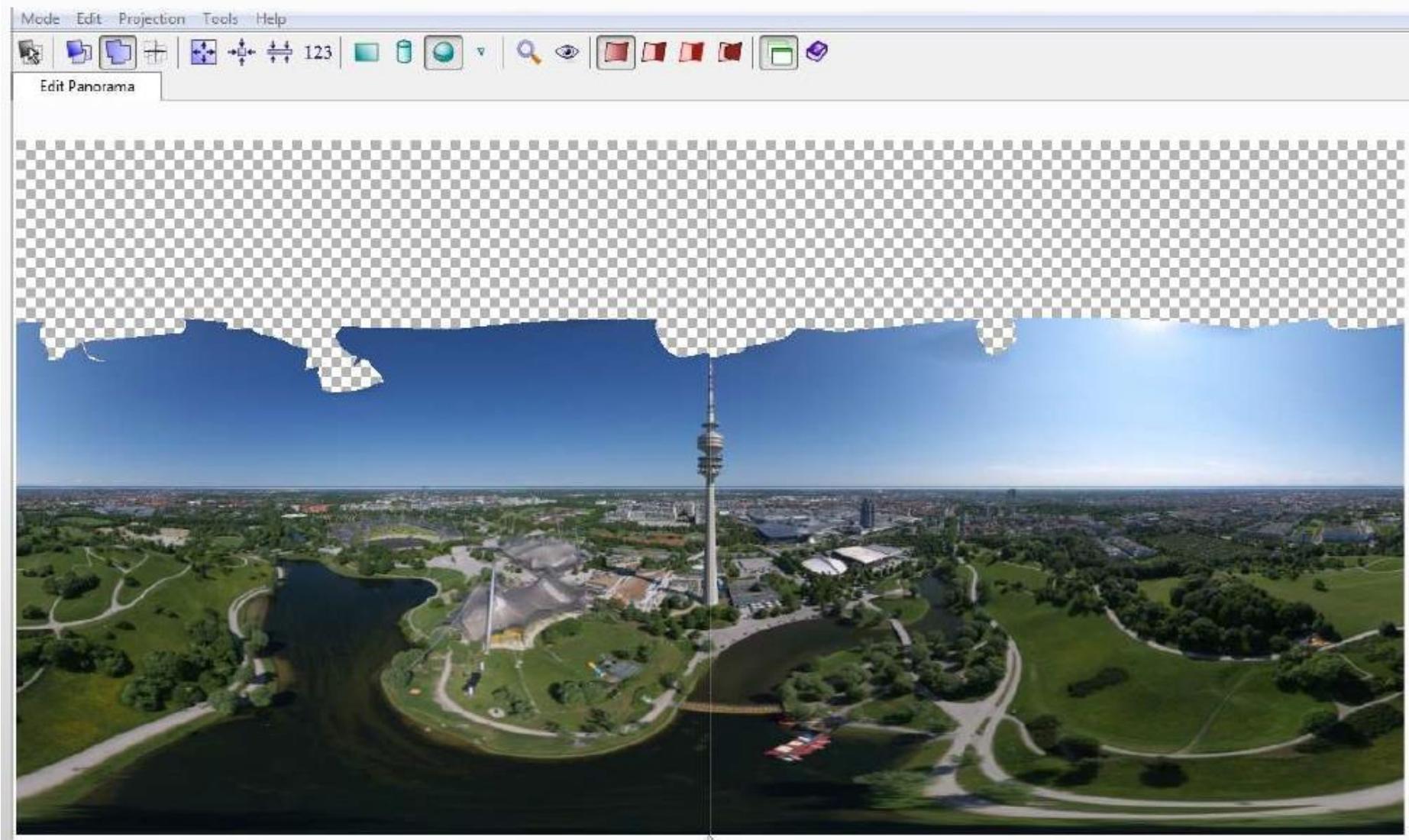
0 1 2 3 4 5 6 7

0 1 2 3 4 5 6 7

Add additional CP and add Green masks to areas you want to preserve

STITCHING WORKFLOW USING PTGUI

Align and optimize the spherical panorama



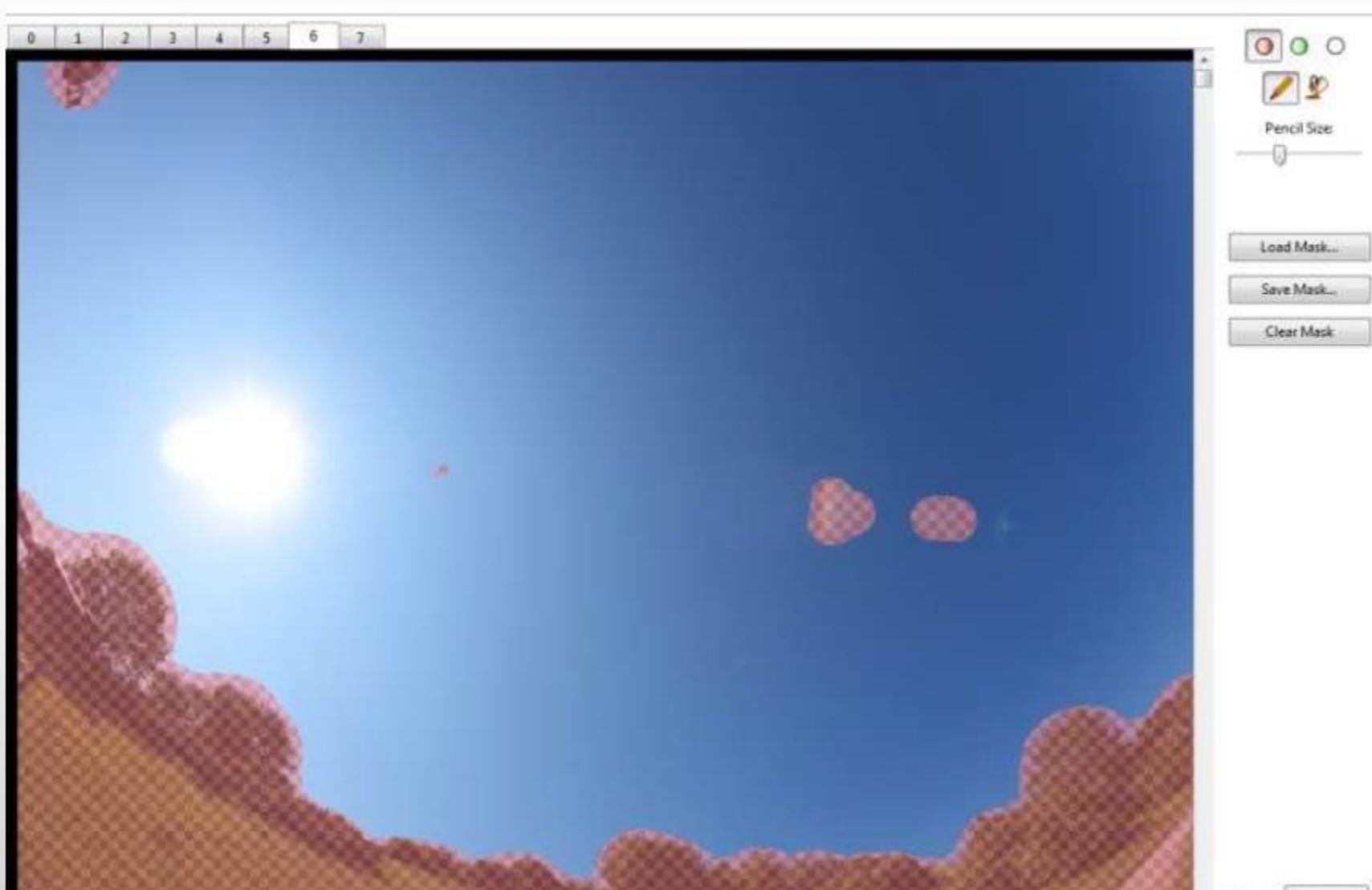
STITCHING WORKFLOW USING PTGUI



- 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

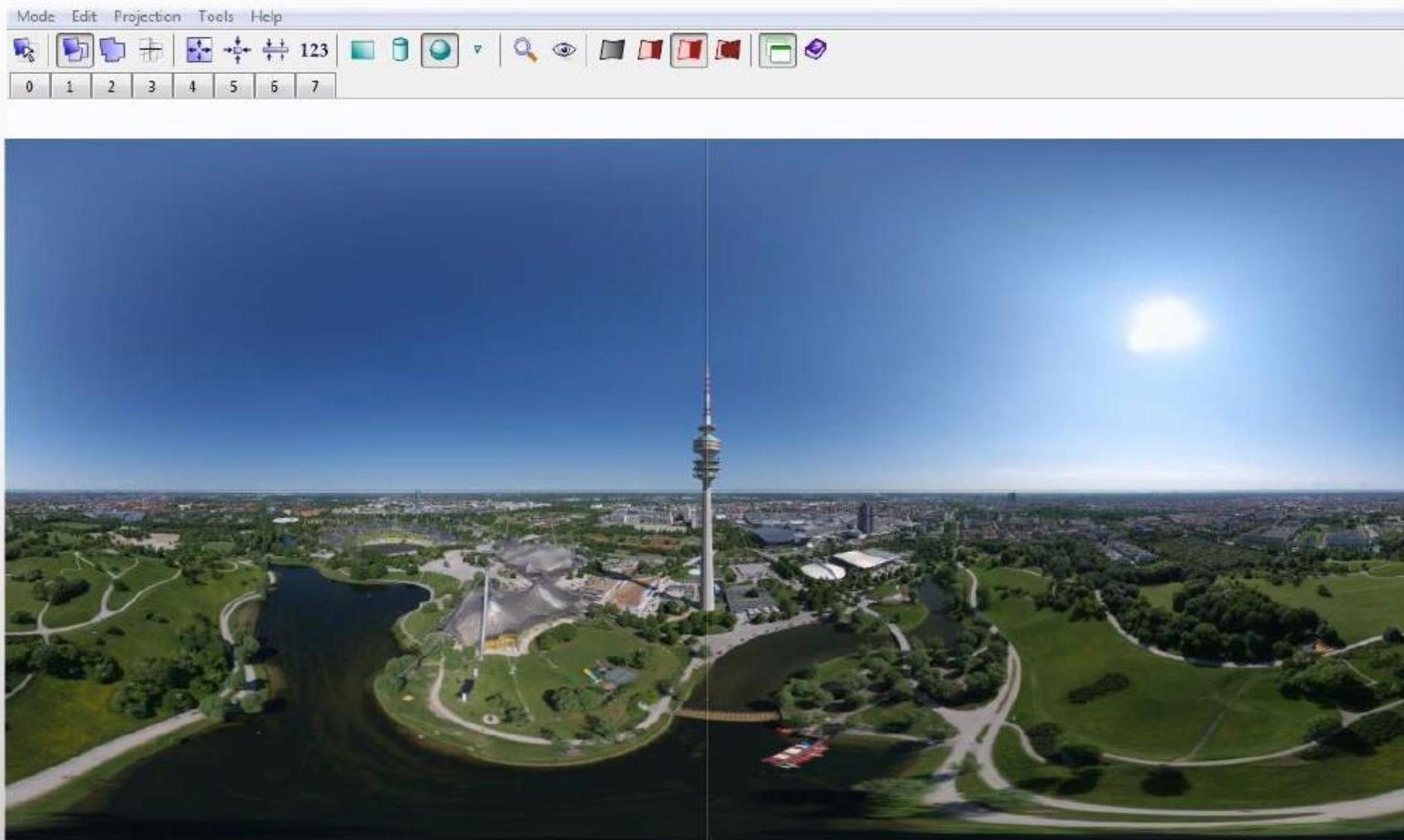
STITCHING WORKFLOW USING PTGUI

- Mask ground objects and lens flares



STITCHING WORKFLOW USING PTGUI

- Check the panorama in Editor



Compare Workflow (PTGui)



Photograph

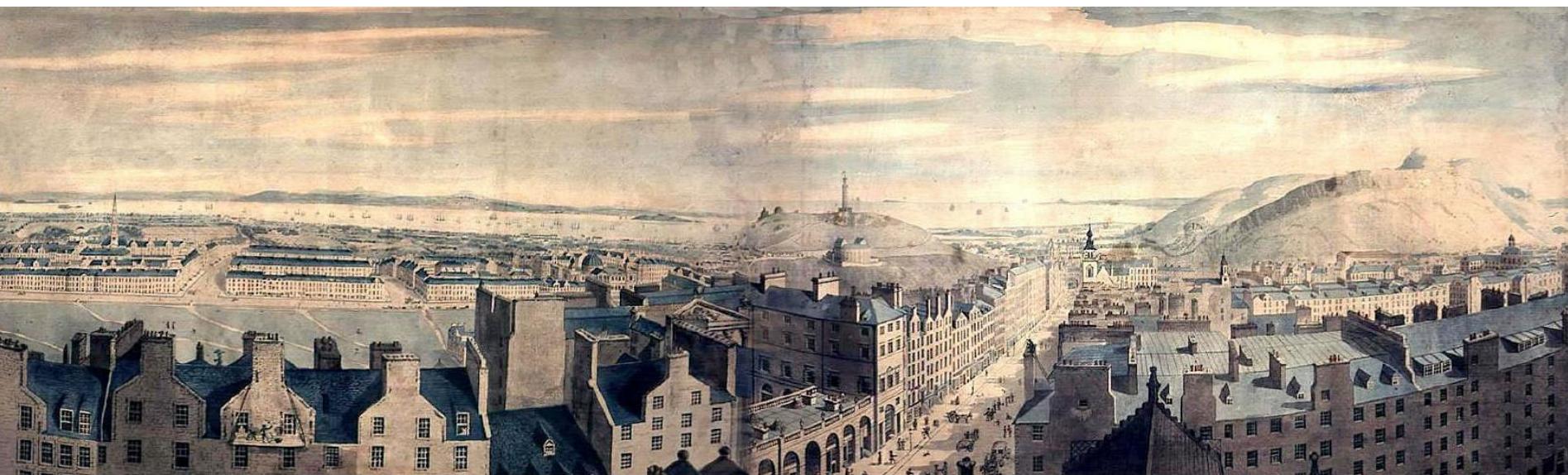


Rendering using the deterministic method



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



This Panorama of 'Old Edinburgh' by Robert Barker is still in existence 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



Virtual 3D Bratislava - APVT Project - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Welcome Project Partners Outcomes Reports City Gallery Links Map

Map

Statue ČUMIL

X: 691 Y: 461 Type: Image Title: Statue ČUMIL File: cumin.jpg

All rights reserved © 2003 Project supported by the APVT grant No. 20-025502 webmaster & designer

Virtual 3D Bratislava Local intranet

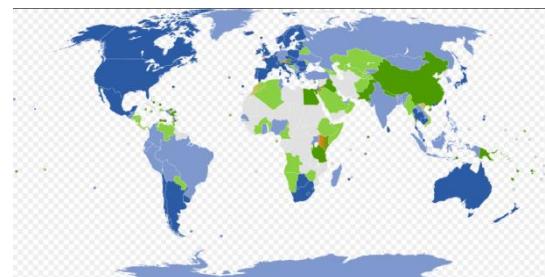
A screenshot of a Microsoft Internet Explorer window displaying a virtual 3D map of Bratislava. The map shows the city's layout with various landmarks. A specific statue is highlighted with a callout box labeled "Statue ČUMIL". The map interface includes a sidebar with links to the project's website, such as Welcome, Project, Partners, Outcomes, Reports, City, Gallery, Links, and Map. The bottom of the window displays copyright information and a logo for "Virtual 3D 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.

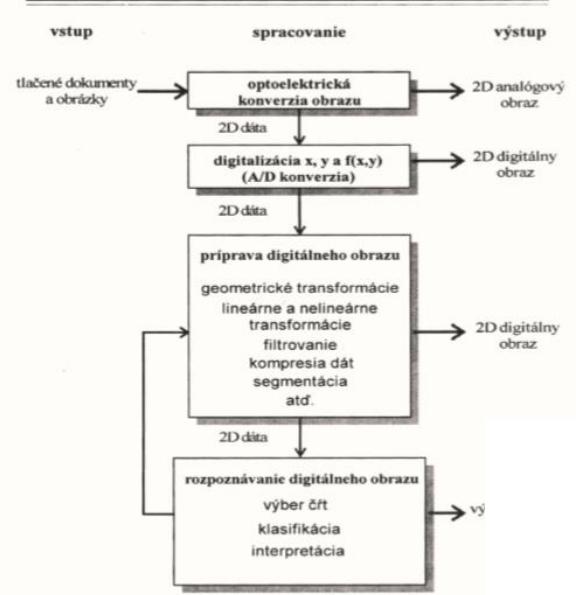


A road junction in [Manchester, England](#), showing
nine different angles

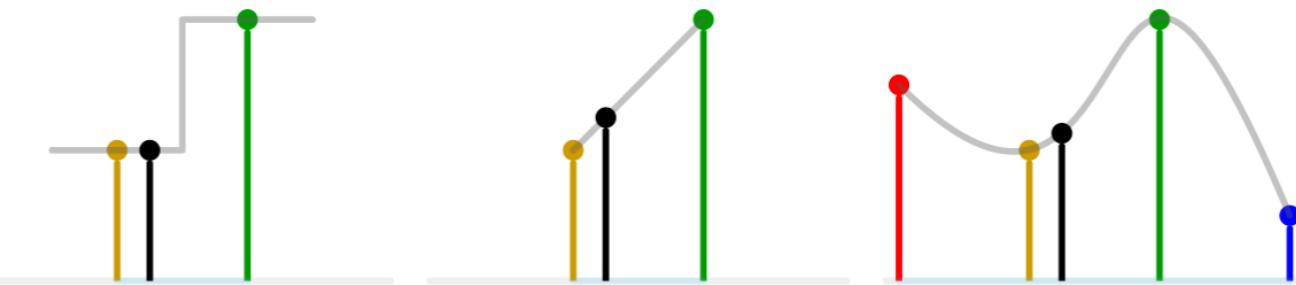
Initial release May 25, 2007; 10 years ago

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

Funkcie na spracovanie obrazu (a dokumentov)
(analýza obrazu)



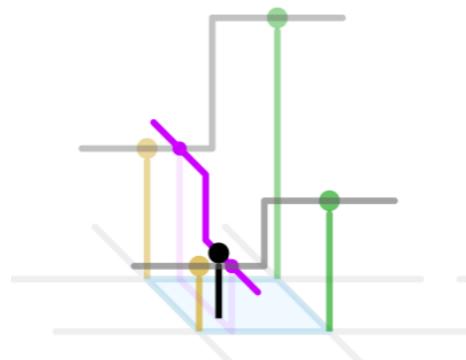
Obr. 1.6 Funkcie na spracovanie obrazu



1D nearest-neighbour

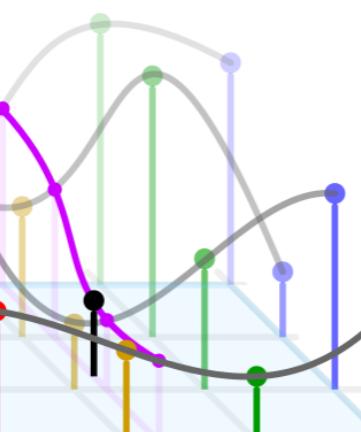
Linear

Cubic



2D nearest-neighbour

Bilinear



Bicubic



Rendering without geometry = IBR

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