

R³

- on three CG research topics -

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IMPA

Goals and Motivation

- Present Trends in Graphics & Vision
- Review State-of-the-Art
- Report Current Efforts at VISGRAF Lab
- Discuss Research Directions
- Entice Prospective Students / Collaborators

Outline

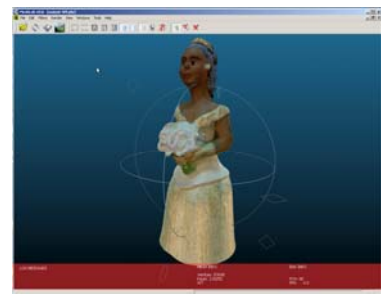
- Common Ground
- 3D Photography
- Omnidirectional Video
- High Dynamic Range Imaging
- Conclusions

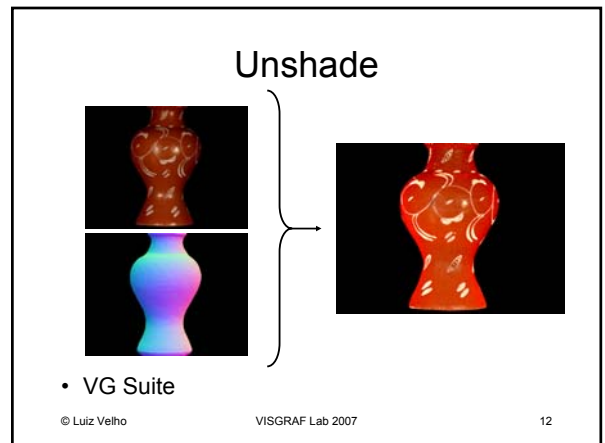
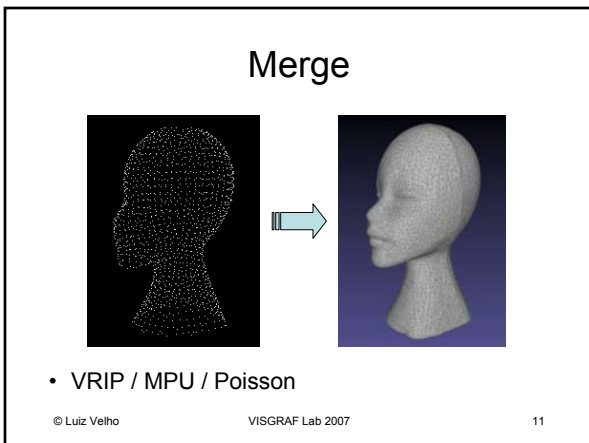
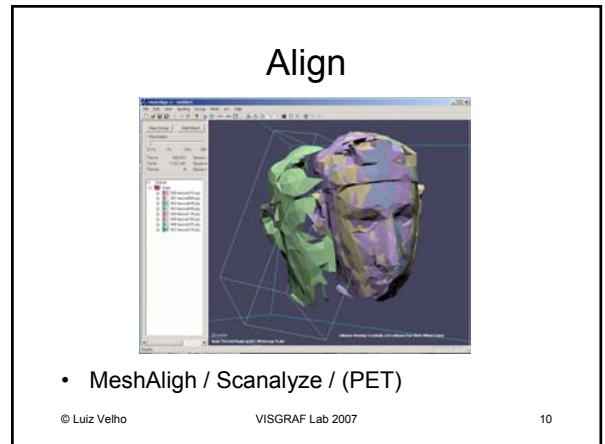
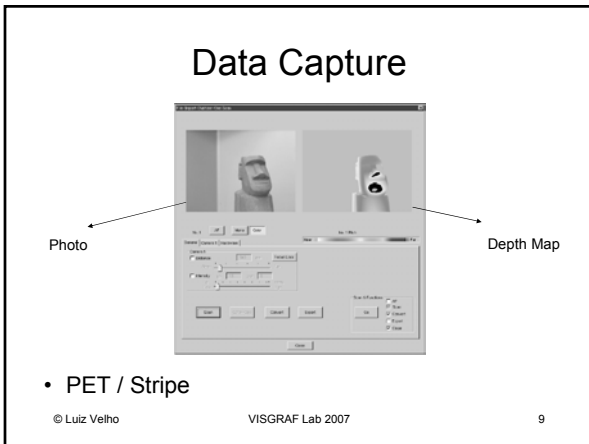
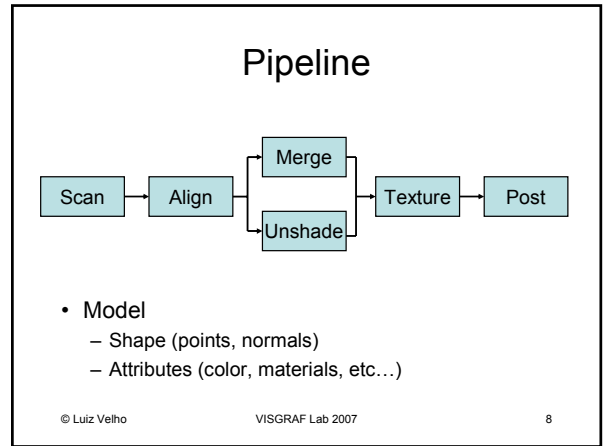
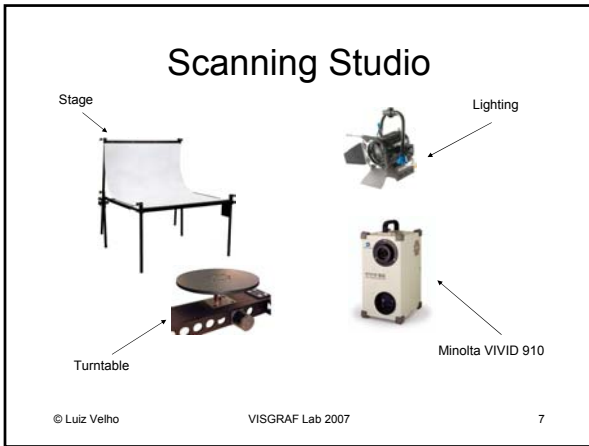
Common Ground

- Same Basic Scenario
 - Data Capture
 - Model Estimation
 - Visualization
- Needs Special Hardware!
- Integrates Analysis and Synthesis
- Many Interesting Applications...

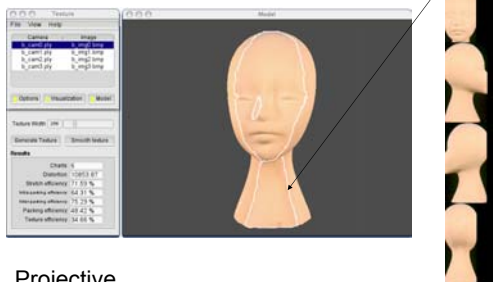
Part I: 3D Photography

Demo





Texture



- Projective

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Post-Process

- Smooth / Simplify / Etc...
- Render



Suggestive Contours



X-Shade



BSSRDF

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Research Directions

- Visualization for the Web
- Generalized Acquisition
- Alternative Model Editing
- Super-Resolution
- and Beyond...

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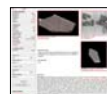
3DP on the Web

- Progressive Visualization / Streaming



(Qsplat)

- Databases



(Forma Urbis)

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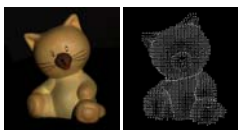
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Generalized Acquisition

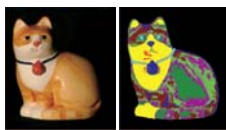
- Surface Properties

Normals



[Seitz 04]

BRDF



[Hertzmann 05]

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Unconventional Editing

- Attribute to Geometry

Shading



[Rushmeyer 03]

Normals



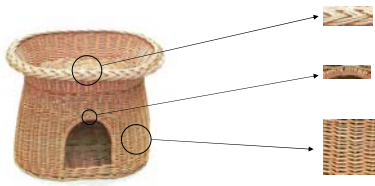
[Guo 04]

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Super Resolution by Example



Beyond Super Resolution

- Model Hierarchy
 - Macrostructure
 - Mesostructure
 - Microstructure

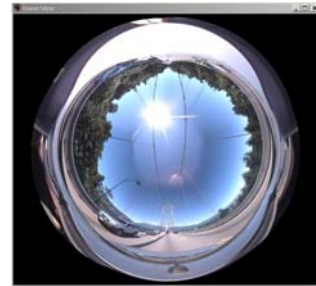


[Chong 05]

Part II:

Omnidirectional Video

Demo



Hardware Set-Up

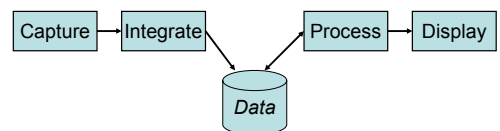
Spherical Camera



Panoramic Projection



Overview



Capture

- Image Processing
 - Demosaicing
 - Devignetting
 - Retification



- LadybugCap

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Integration

- Construction
 - Stitching
 - Deghosting
 - Etc...
- Model



[Szeliski 04]



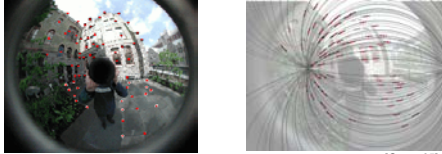
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Processing

- Non-Linear Projective Geometry
 - Point Tracking
 - Optical Flow
 - Etc...



[Geyer 05]

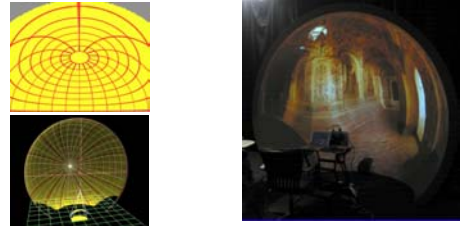
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Display

- Immersive Curved Projection



[Bourke 04]

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Research problems

- BG / FG Extraction
- View Stabilization
- Warped Display
- Non-Linear Narratives

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BG / FG Extraction

- Static Camera / Moving Subjects



OBS: Applications ...

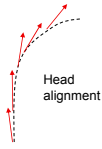
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View Stabilization

- Moving Camera
 - Ego Motion
 - Orientation Estimation



[Szeliski 05]

Expressive Viewing

- Fragmentation / Distortion



[Offenhuber 06]

Non-Linear Narratives

- Movie Maps ...



[Aspen, 78]

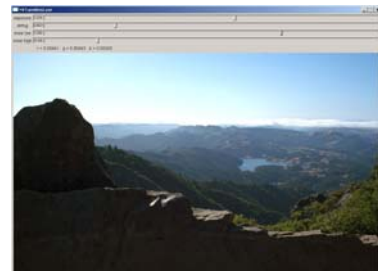
Seeing It One More Time



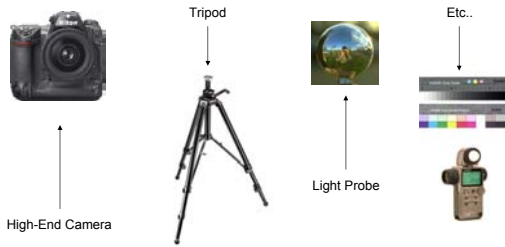
Part III:

High Dynamic Range Imaging

Demo



Equipment

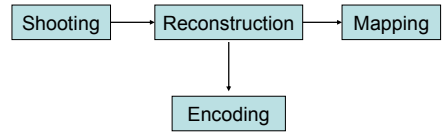


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Overview



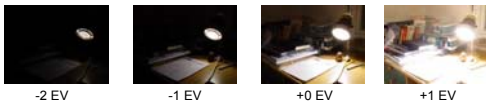
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Shooting

- Multiple Exposures



- Assumptions
 - Static Camera / Scene
 - Fixed Illumination

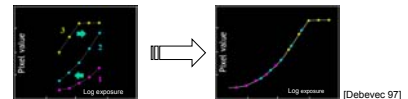
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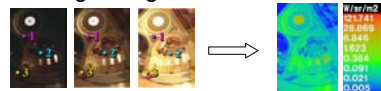
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Reconstruction

- Response Curve Estimation



- HDR Image Integration



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Encoding

- Image Formats
 - Radiance RGBE (.hdr)
 - SGI LogLuv (.tiff)
 - IEEE 96-bit (.tiff)
 - ILM OpenEXR (.exr)
 - Brightside JPG-HDR (.jpg)
- Video Formats
 - HDR-MPEG

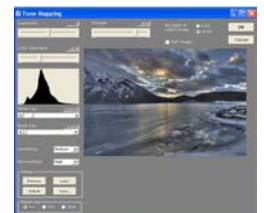
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Mapping

- Tone Reproduction
 - Display Range
 - Visual Perception
- Methods
 - 30+ papers
 - No Ideal Solution...



(photomatix)

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Research Problems

- Video HDR
- Artistic Tone-Mapping
- IBL / Rendering

Video HDR

- Acquisition / Reconstruction
- Compression
- HDR Playback
- Panoramic Video / Light Probes



Artistic Tone-Mapping

- Interactive



[Lichinski et al 06]

- By Example



[Bab et al 05]

IBL and Rendering



NICK BERTKE

Conclusions

- Other Research Areas
 - Geometric Modeling
 - Character Animation
 - Physical Simulation
 - Etc...