

# HPC for Vision and Graphics

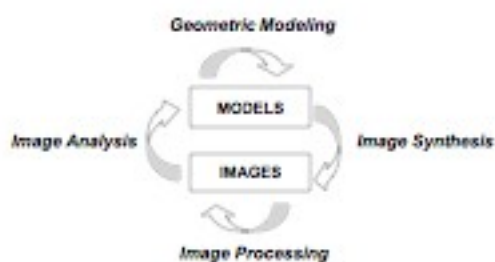
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## Outline

- Complementary Perspectives
  - Areas / Applications
  - Tools / Resources
- Challenging Problems
  - Science / Technology
  - Experiences / Examples

## Visual Computing

- Computational Applied Mathematics



# ... and More

## *Media Computing*

- Adding Time
  - Analysis, Control / Motion / Animation / Video
- Human-In-The-Loop
  - Interaction / Exploration

# Strategic Area

- Multidisciplinary
  - Own Focus / External Relations
- Instrumental
  - Problems / Solutions
- Transcendental
  - Technology / Society

# Challenges

*"SIGGRAPH: Future Directions of Graphics Research", 2010*

- Virtual Human
- Very Large Datasets
- Interaction
- Education and Knowledge Dissemination
- Modeling Simulation to Action to Design

# Research Areas

- Simulation
  - Physics / Engineering (Optimization)
- Learning
  - A.I. (Probability & Statistics)
- Visualization
  - Art, Design / Sciences (Geometry & Topology)
- Interfaces
  - Psychology / Perception (Game / Control Theory)

# Some Examples

- Gigapixel Imaging
  - Rio-HK / Time Machine (G-Cam)
- Augmented Reality
  - RT Illumination / BRDF's (Titan)
- Immersive Experiences
  - View in Spaces (Allosphere)

# The Largest Image



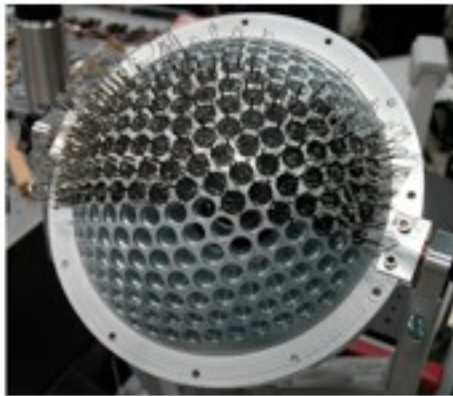
- Size: 0.15 Terapixels (800K x 200K)
- Acquisition: 4 h 45 min
- Processing: 8 days

# Time Machine



- 210 MP panorama was taken every 15 minutes for 32 days

# AWARE-2



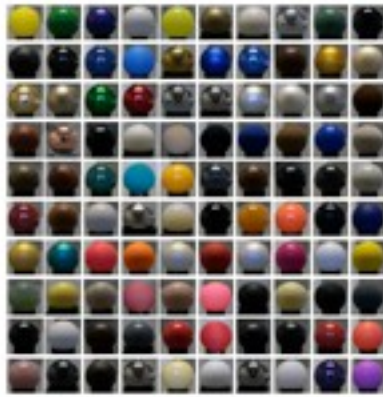
- 50 Gigapixels Video Camera (DARPA 5 year project)

# Augmented Reality



- Path Tracing on GPU

# MERL BRDF Database



- 100 Measured Materials (23.328.000 bins each table)

# Titan



- 20 Petaflops / 299,008 Cores / 46,645,248 CUDA Cores

# View in Spaces



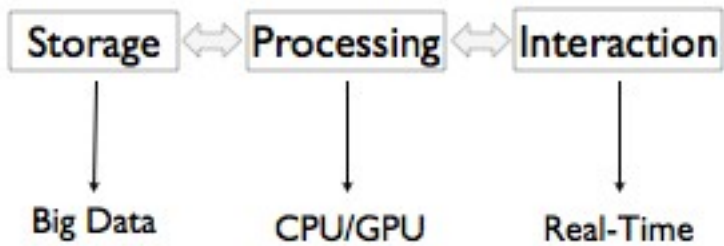
- Inside View of Hyperbolic 3-Manifold

# UCSB Allosphere



- World's Largest Immersive Environment

## Not Just FLOPS!



## Make It Easy...

- Wide Access
  - Networking / Mobile
- Instant Prototyping
  - Languages / Compilers
- Touch the Data
  - Natural Interfaces

**The Beginning...**