

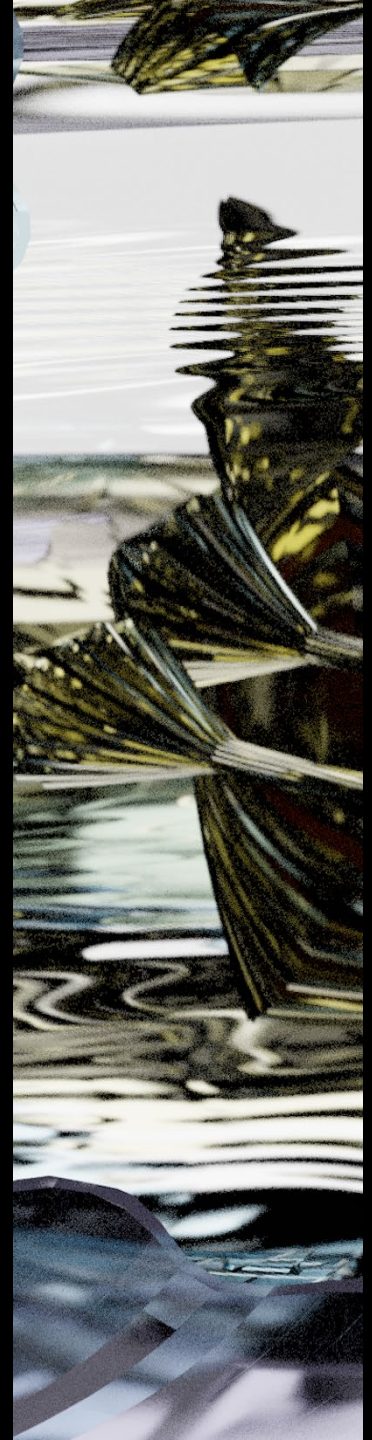
Recontextualizing Data Visualization Toward Data Realization

Michael Rhoades, Ph.D.



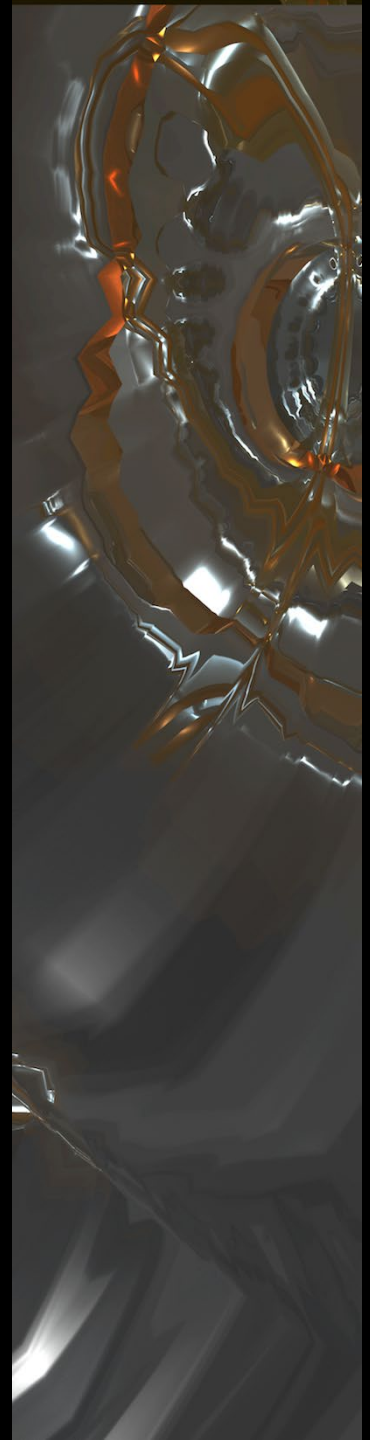
About the Speaker

- Bifurcation of Practice
- Lead HCI Researcher/Artist in the IDIA Lab
- Personal Research and Creative Praxis
- Interdisciplinary Ph.D. in 2020 at Virginia Tech
- 3D/360° Computer-Generated Music Composition (Holophonic)
- 3D/360° (Stereoscopic) Aleatoric Visual Composition (pseudo Holographic)
- High-Performance Computing (Beowulf Clustering)
- Convergence in Composition of Visual Music
- Intended for Head-Mounted Display, Proprietary Projection or LED Systems, Full Immersion Domes, and High-Density Loudspeaker Arrays



Presentation Agenda

- Introduction
- Data Visualization vs. Data Realization
- Benefits
- Implementation
- LHC Sonification Project
- VR Drone Project
- Recapitulation
- Q&A

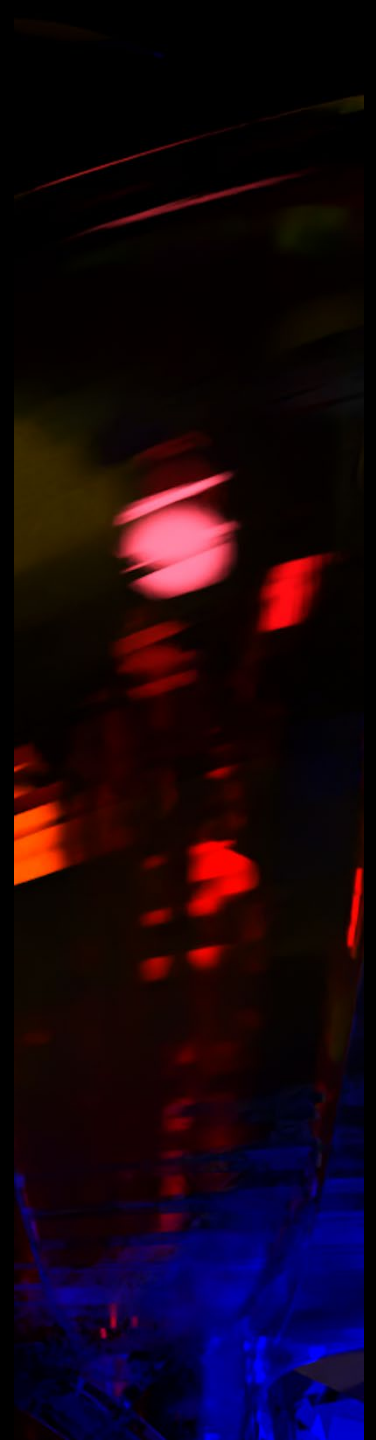


Data Realization

- XR Implementation Occurring in Numerous Projects i.e. Elizabeth Baron, Oliver Kreylos... and Numerous Others
- NSF CAAV Talk Included Sonification as a Form of Data “Visualization”
- 2D vs. 3D Visual Information
- True Audio and Visual 3D Includes Depth Perception

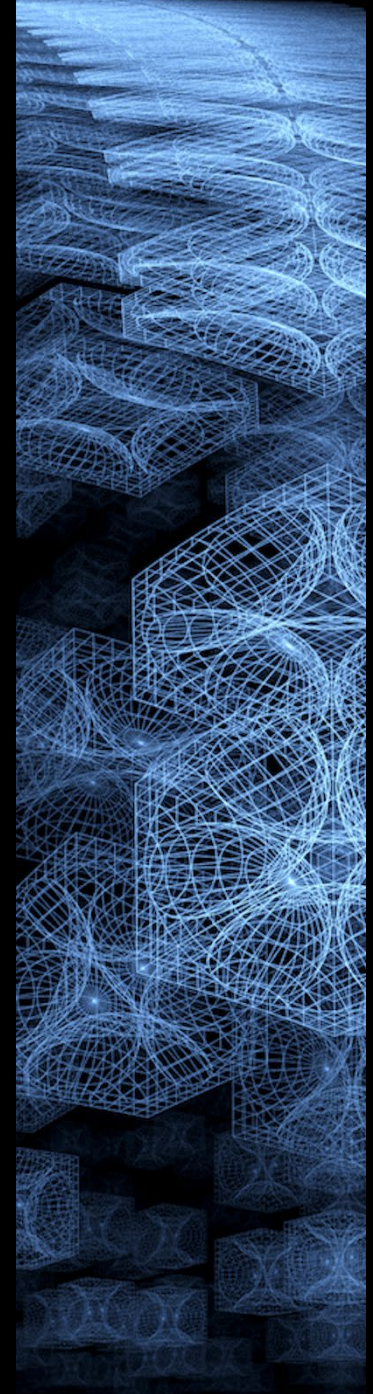
Data Visualization
Data Auditorialization
XR Approaches
+ Three-Dimensionality

Data Realization



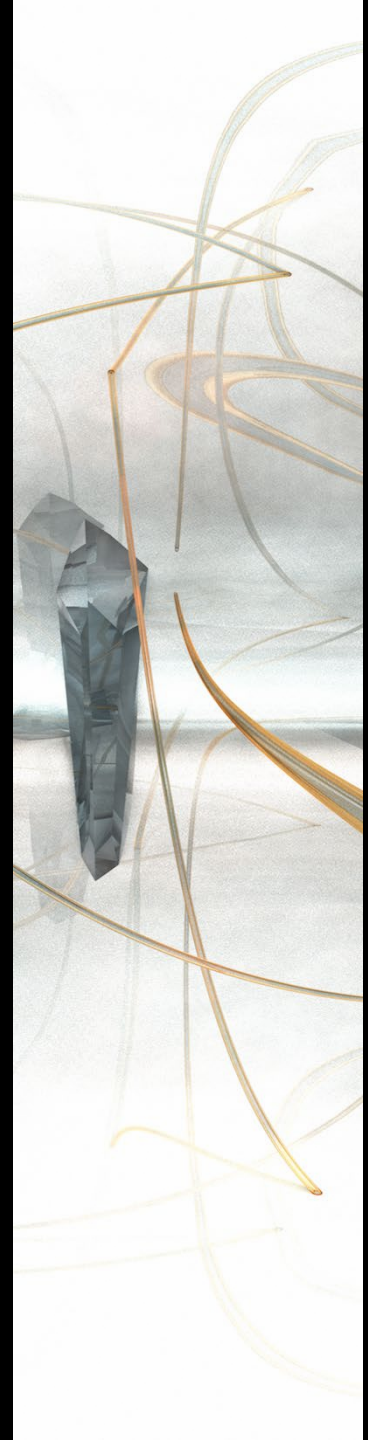
Benefits

- Audio/Visual Coupling
- Full Immersion = Realization
- Perception on Multiple Levels (Multiple Sensorial Bio-Mechanisms)
- Exponential Increase in Understanding Data Representations
- Greater Awareness of Norms and Outliers



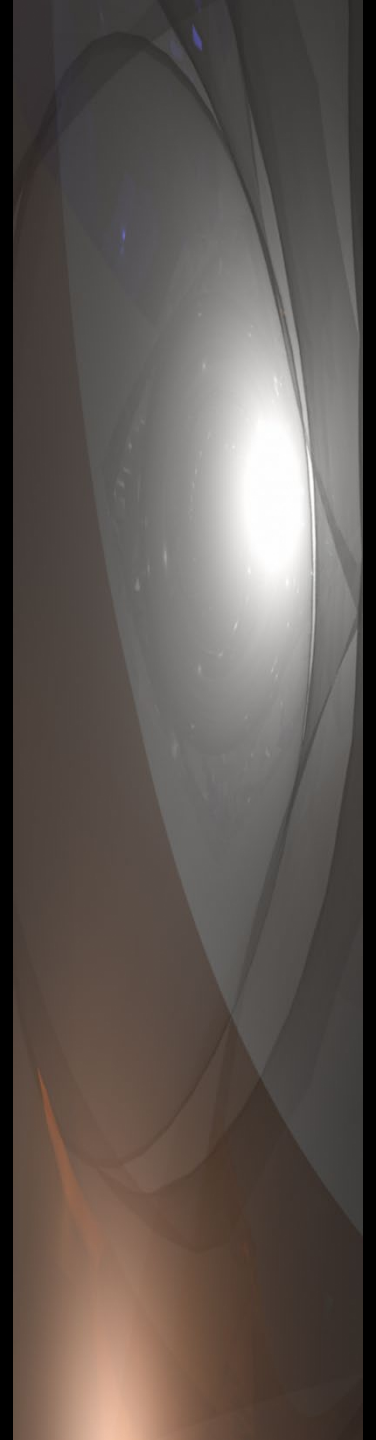
Implementation

- Requires Intermedial Expertise
- Holochory – Umbrella Term (Wavefield Interference Patterns)
- Holophony - Convolution Reverb, VBAP, High Order Ambisonics
- Pseudo Holography – Stereoscopy
- High-Performance Computing
- Mode of Visual Presentation – Head-Mounted Display, Proprietary Projection Systems
- Mode of Audio Presentation – High-Density Loudspeaker Array, 3D Cuboidal Loudspeaker Configuration
- Linking and Synchronizing the Above



LHC Sonification

- Dr. Lilly Asquith
- Data Streams from Proton Collisions
- Auditory Perception as an Extension of Visual Perception
- Auditory Perception of Otherwise Overlooked Outliers



Excerpt from “Emergence”

1st Movement

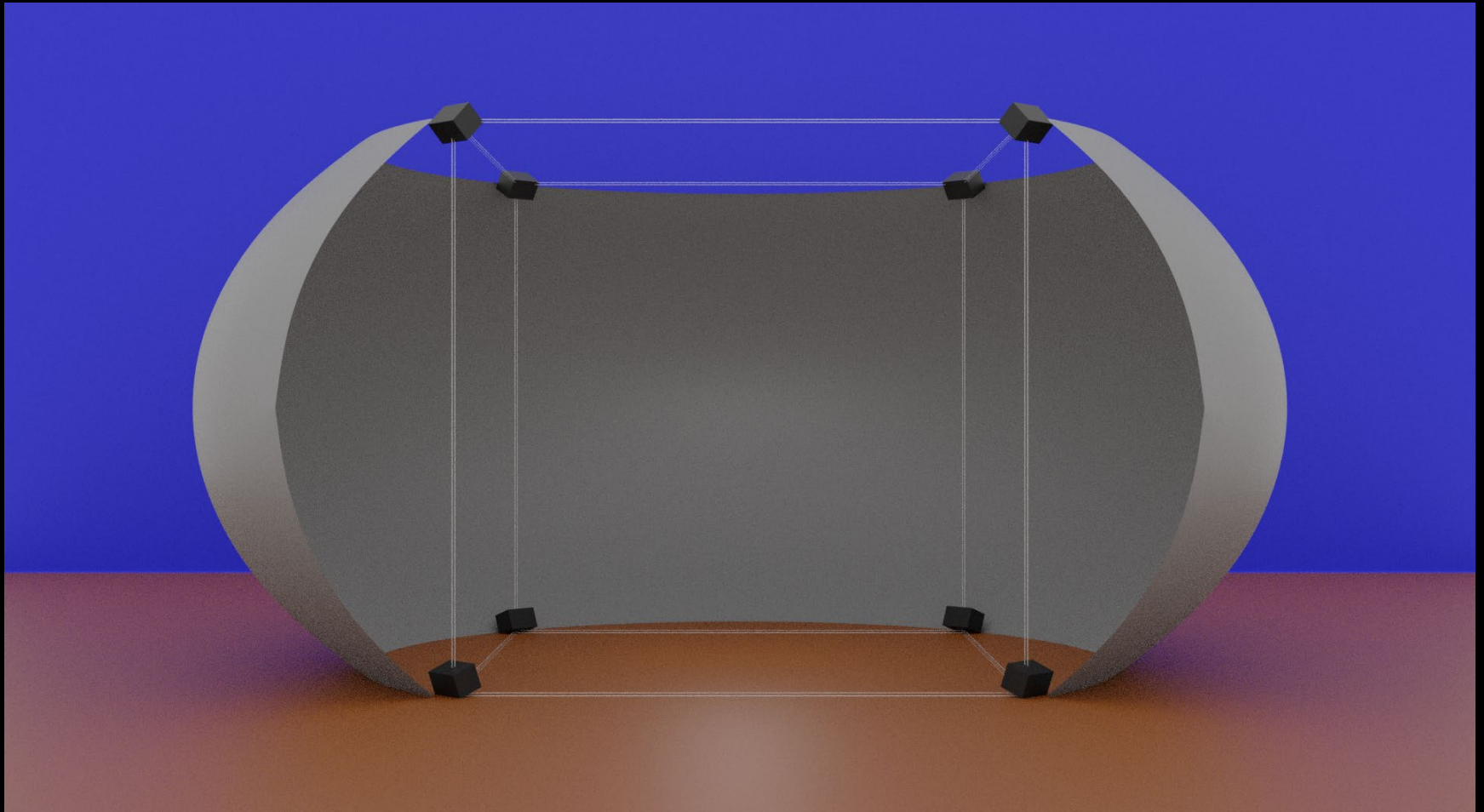


VR Drone Research Project

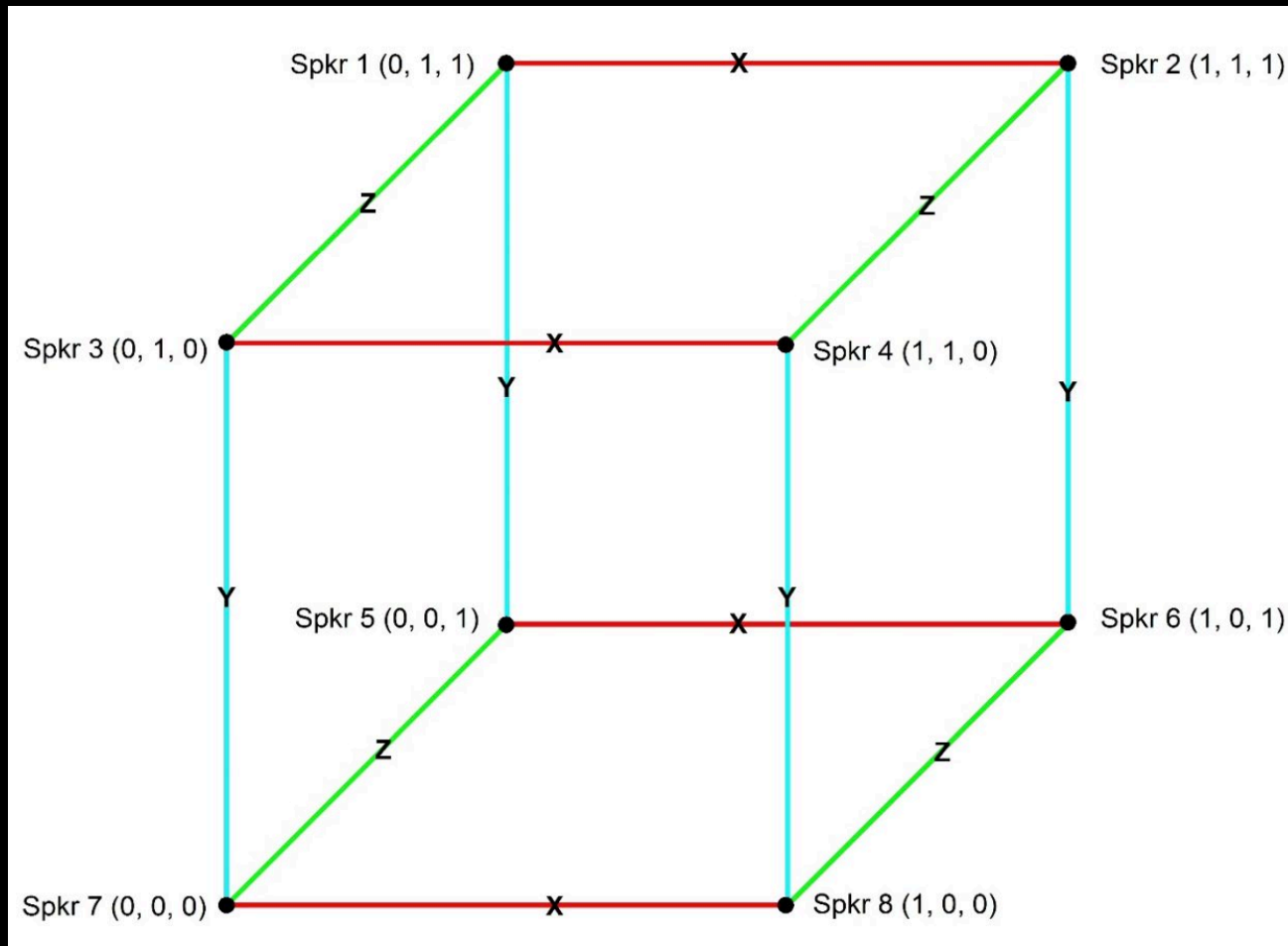
- Project Suggested by IDIA Director John Fillwalk
- Coupling Audio/Visual Perception
- Enhancing Object Localization
- Unity Game Engine
- Cycling 74 MAX
- OSC Transmission of Cartesian Coordinates
- Greatly Enhanced by Visual Stereoscopy



CAVE Audio/Visual Configuration

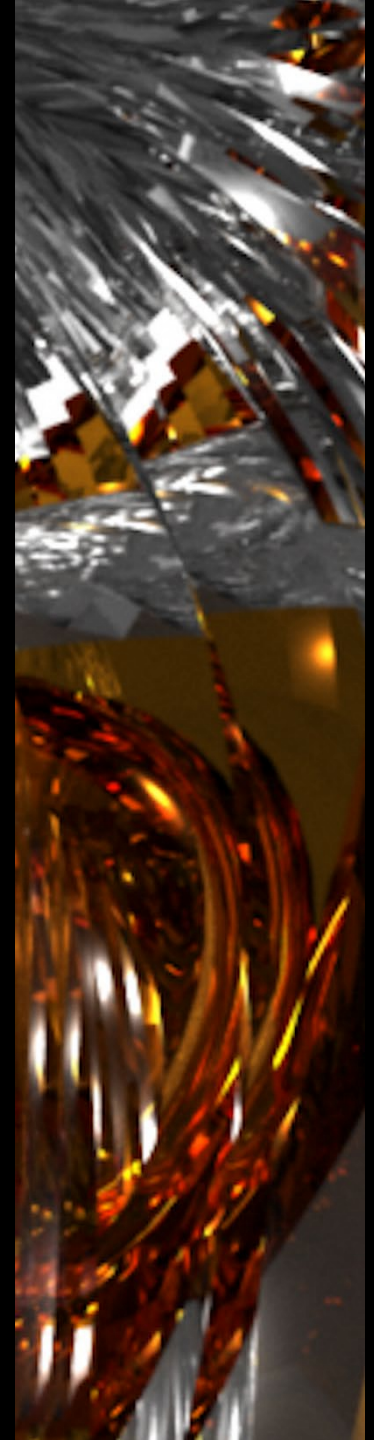


Cartesian Coordinates Mapped Onto CAVE



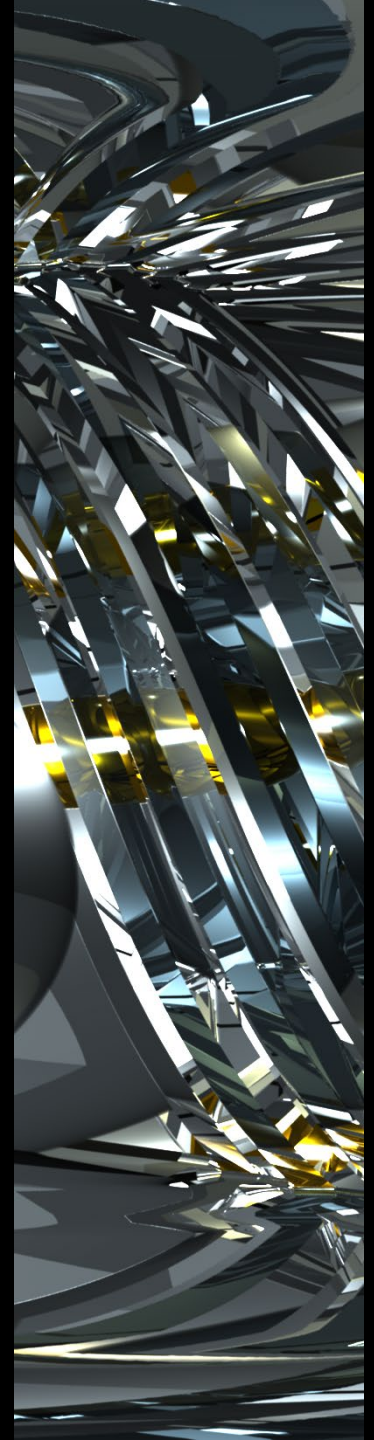
Recapitulation

- Proposing a Shift - Recontextualizing Data Visualization Toward Data Realization
- Requires Intermedial Expertise
- Auditory Stimulus Inclusion
- 3D/360° Stereoscopic Visualization
- 3D/360° Auditorialization
- Appropriate Presentation Venue
- Increased Perceptual Awareness – Spatial Information
- Improved Human Comprehension of Overwhelming Data Sets – Immersive Analytics
- For Artists, Novel Aesthetical Potentials



Thank You for Listening!

Q&A



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