

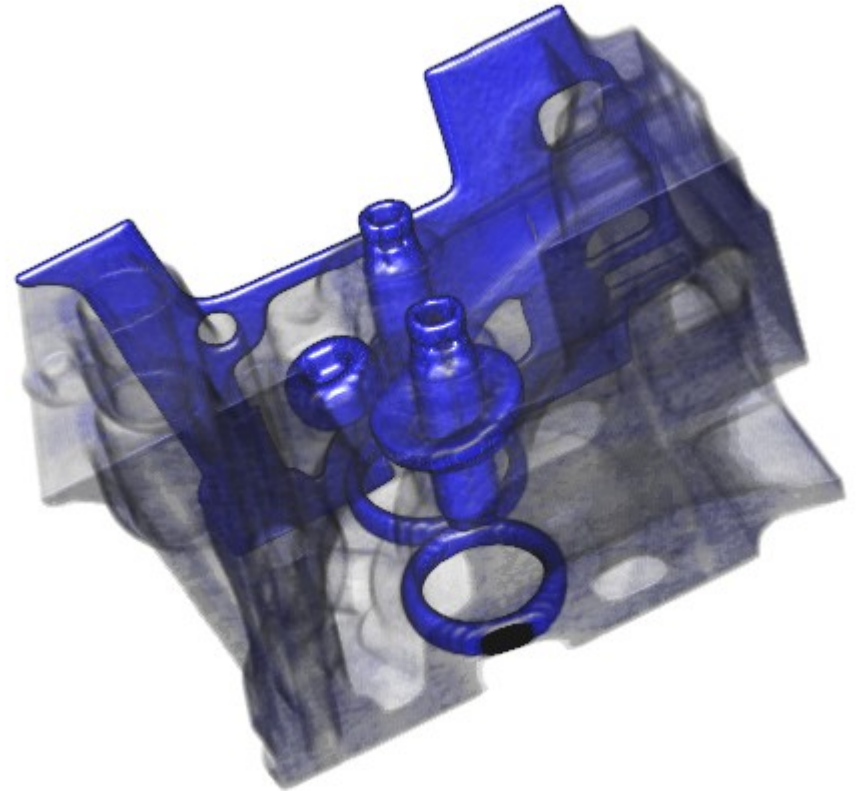
f3dvr

f3d volume renderer

Michal Červeňanský

Overview

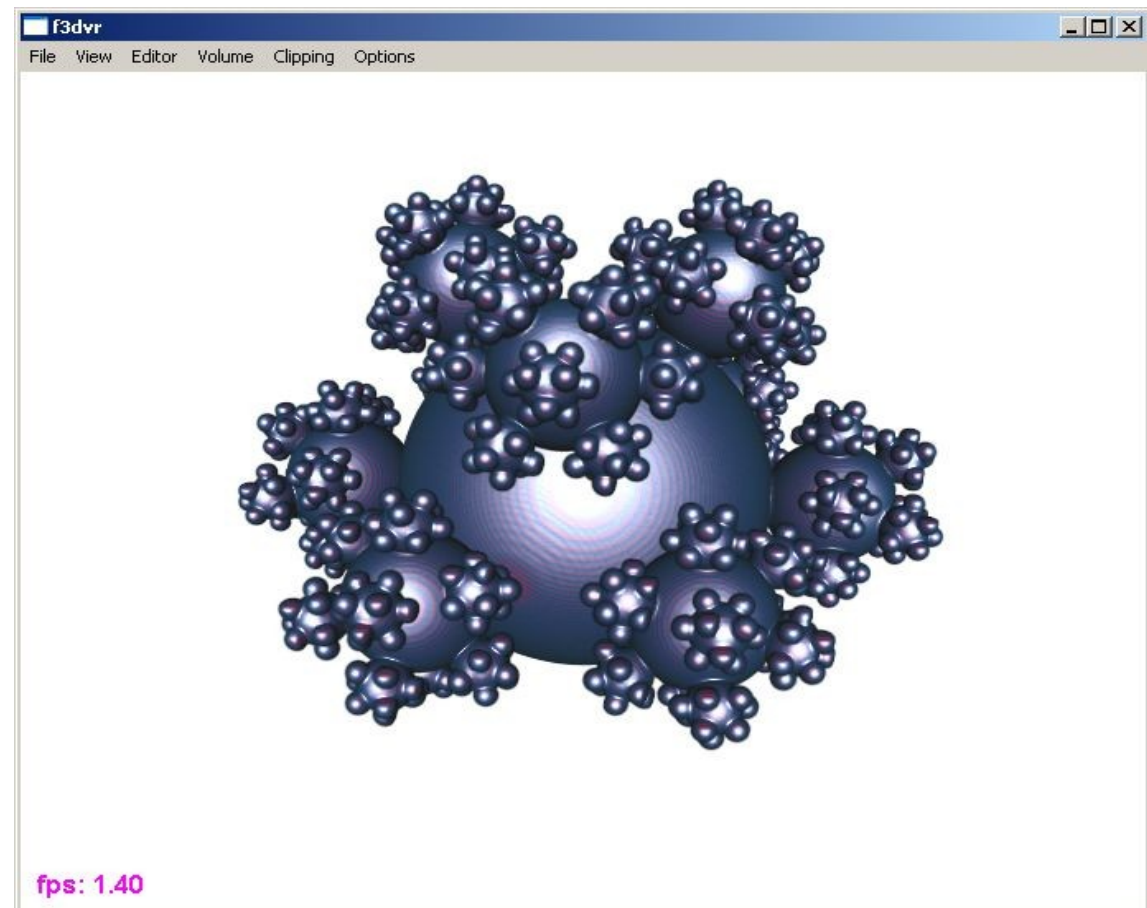
- Motivation
- Data input
- Rendering modes
- Classification
- Settings
- Others



Motivation

- Program for visualization volume data
- Graphics card, OpenGL 1.4, Cg
- Shader model 2.0
- Windows / Linux

- <http://www.sccg.sk/~cervenansky/f3dvr/>



Data input

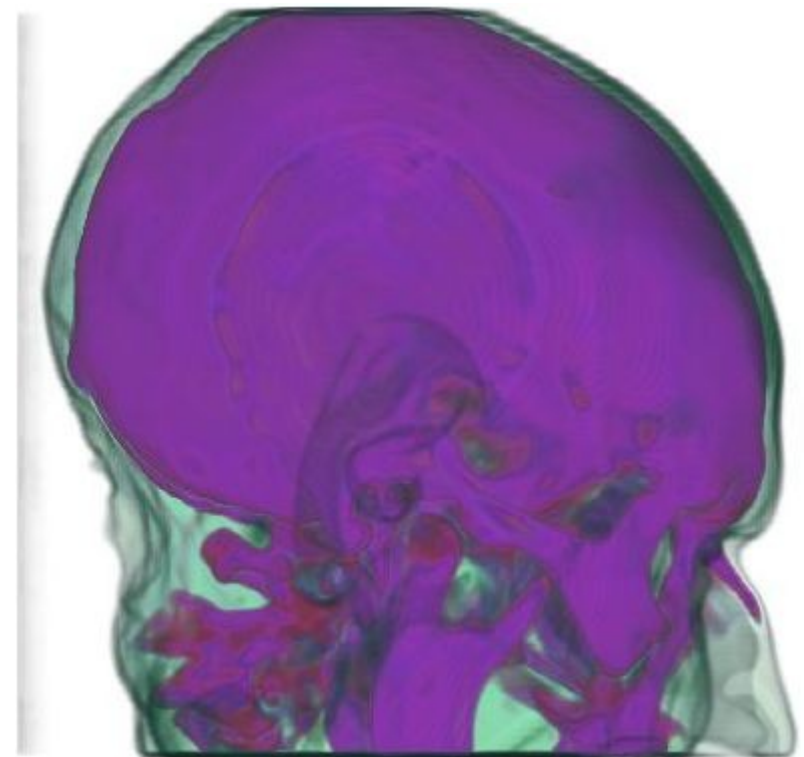
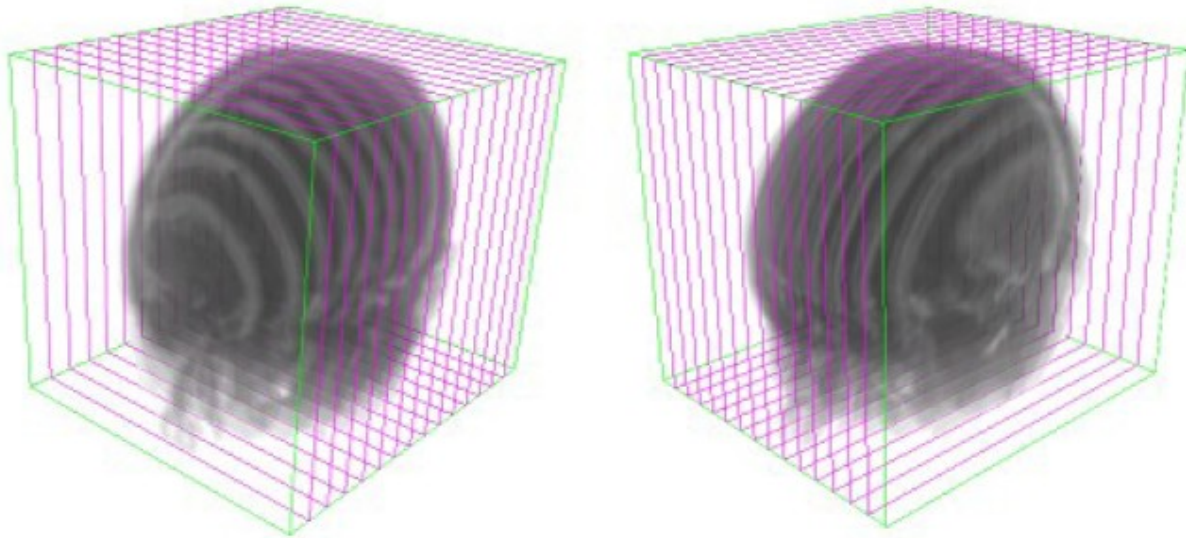
- f3d format / raw format (description file)
- 8/12/16/bit fixed data
- 32bit float data $\langle 0, 1 \rangle$
- Scalar, Colour (2/3/4)
- NPOT \rightarrow POT (older GPU)
- Highest value $< 85\%$ range \rightarrow scaled

Rendering modes

- 2D/3D textures used
- 2D – OAS, Multi-textures
 - restriction 2048^2 , 4096^2
- 3D – VAS, ray-casting, gradient, lightning, ...
 - Restriction 512^3 , 1024^3
- Bricking (in progress)

2D textures - OAS

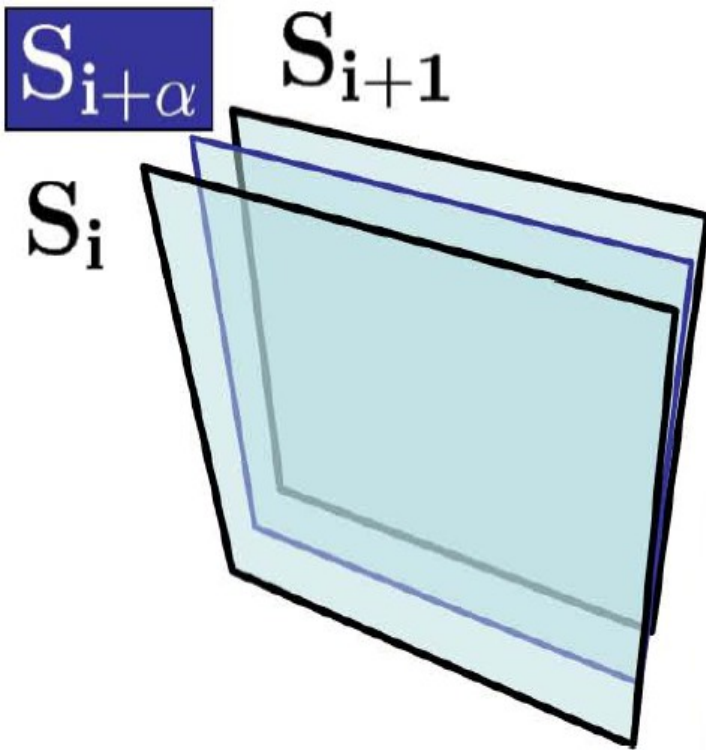
- OAS – object aligned slices



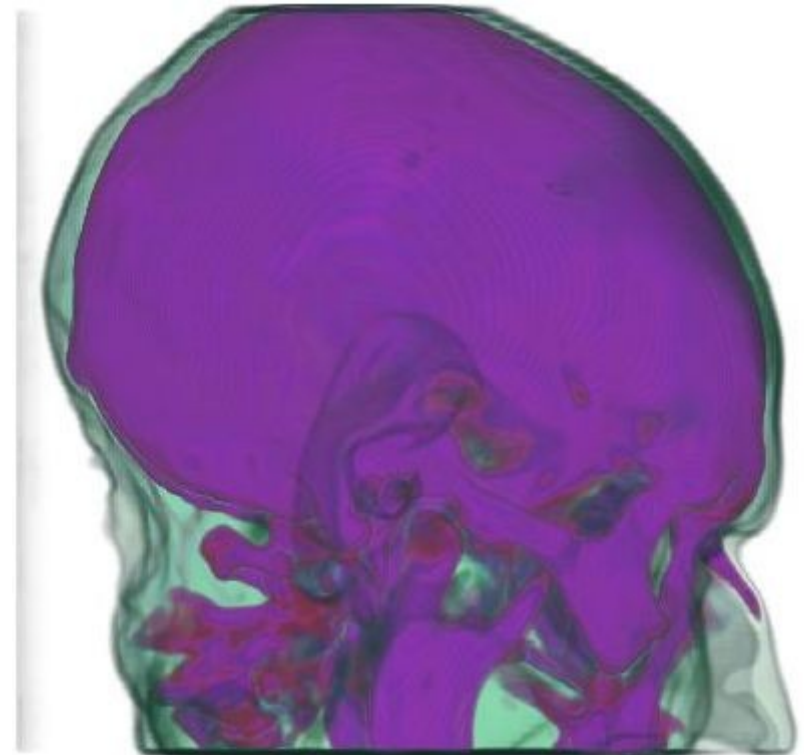
2D textures

Multi-textures

- Usage of multi-textures (2 textures per polygon) to implement trilinear interpolation

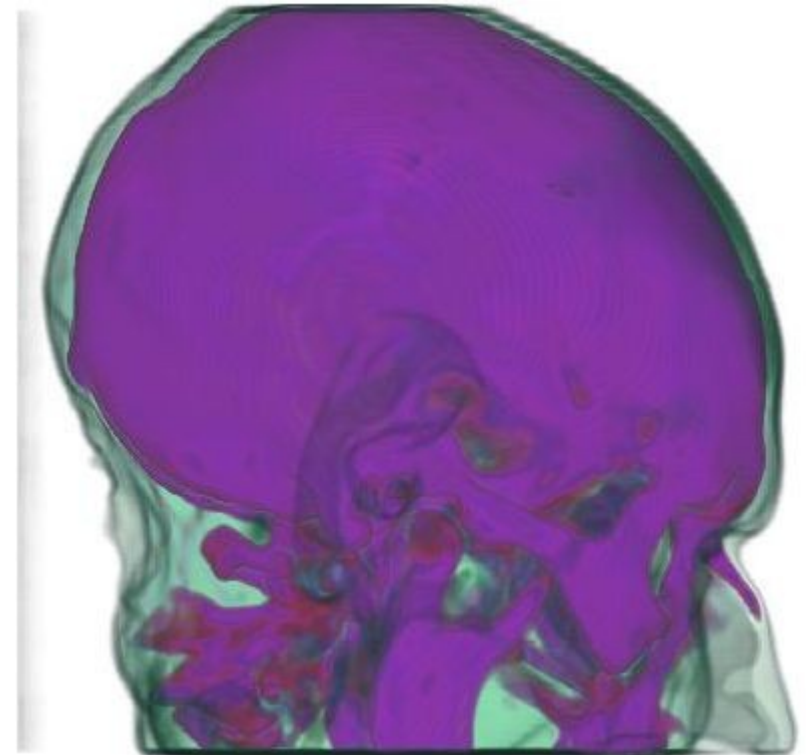


$$S_{i+\alpha} = (1 - \alpha)S_i + \alpha \cdot S_{i+1}$$



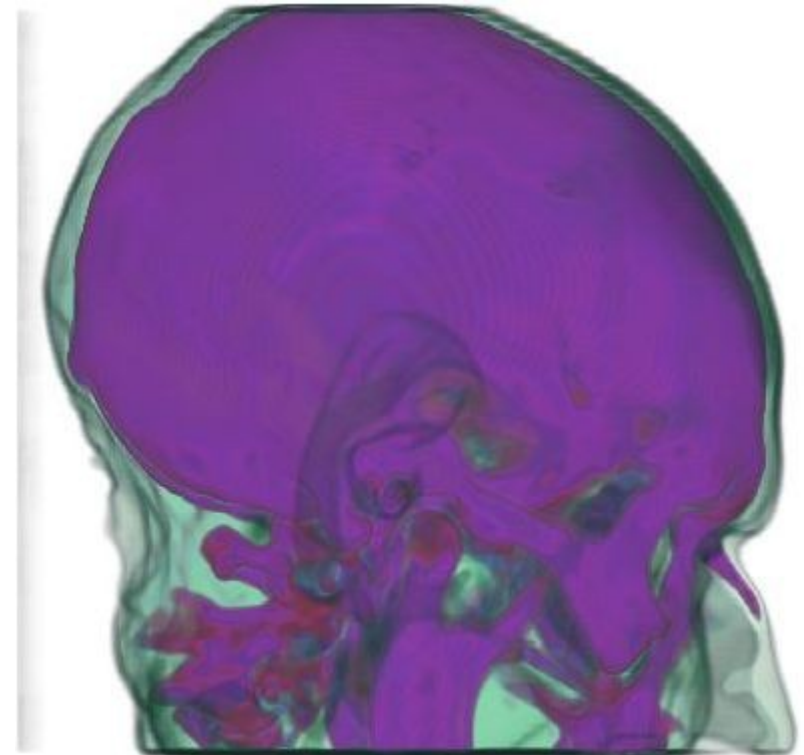
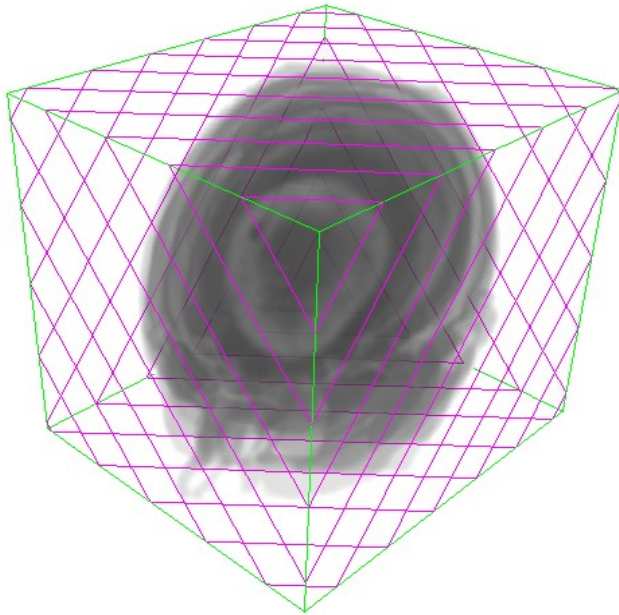
3D textures - OAS

- OAS – object aligned slices



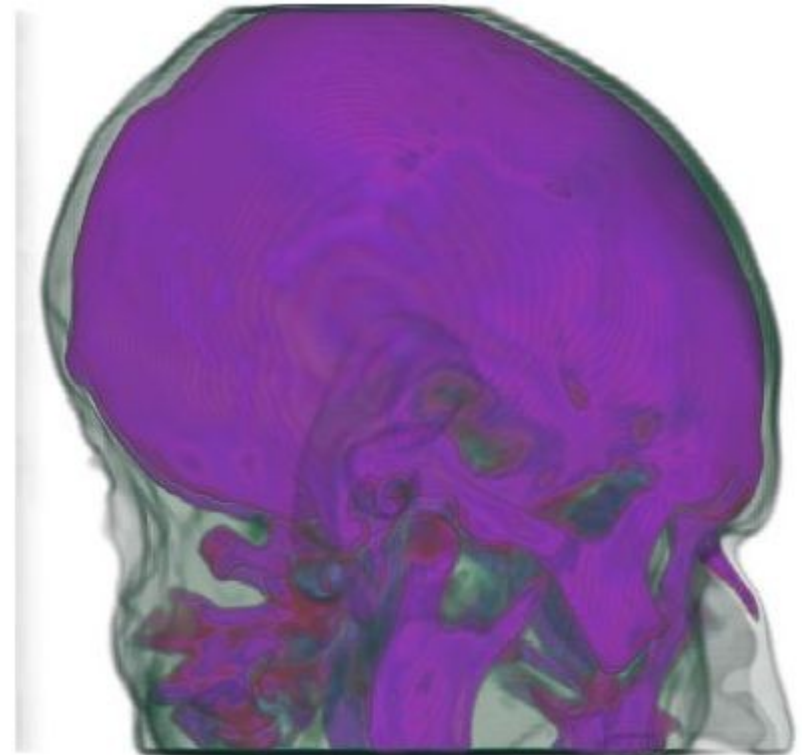
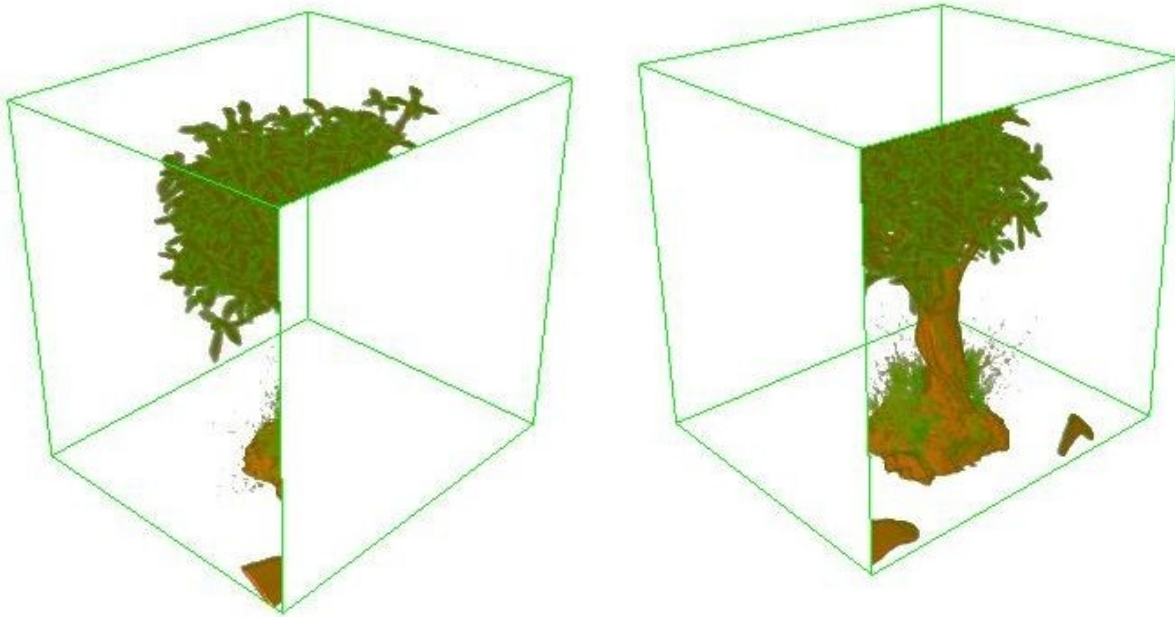
3D textures - VAS

- VAS – view aligned slices



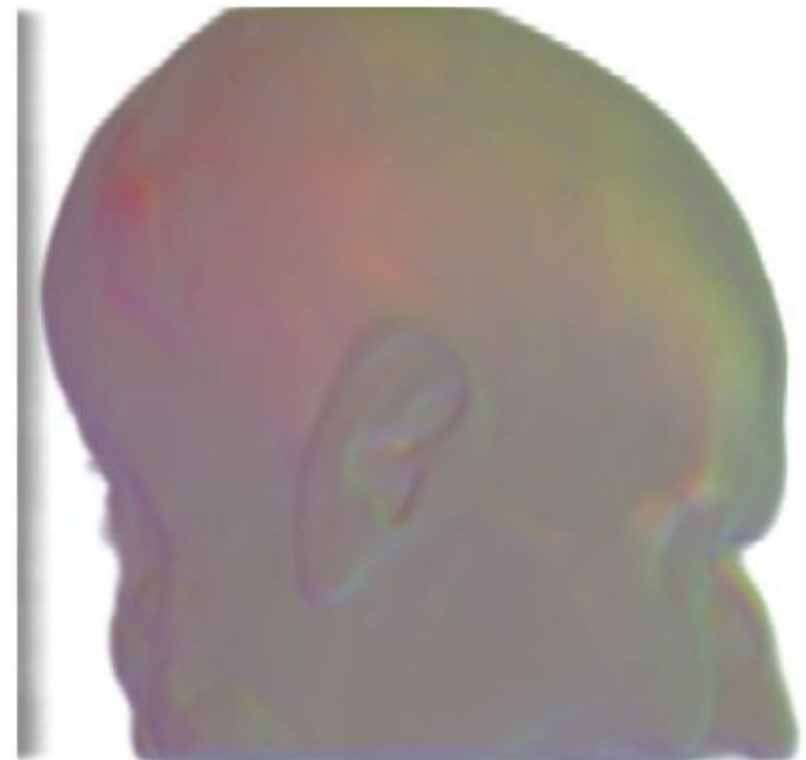
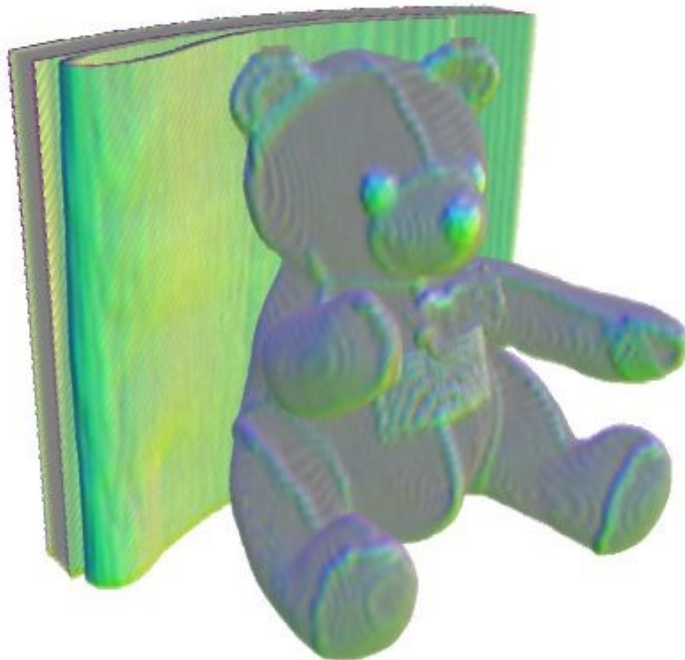
3D textures - ray-casting

- Render faces of the BB



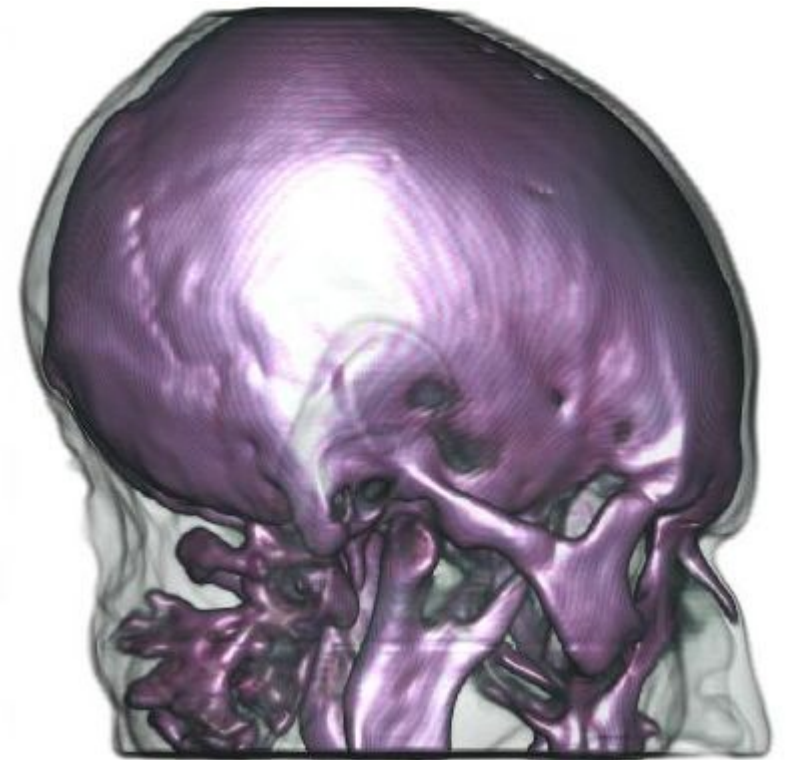
3D textures - gradient

- Normalized gradient \rightarrow colors
- Precomputation / on the fly
- Stored in separate texture



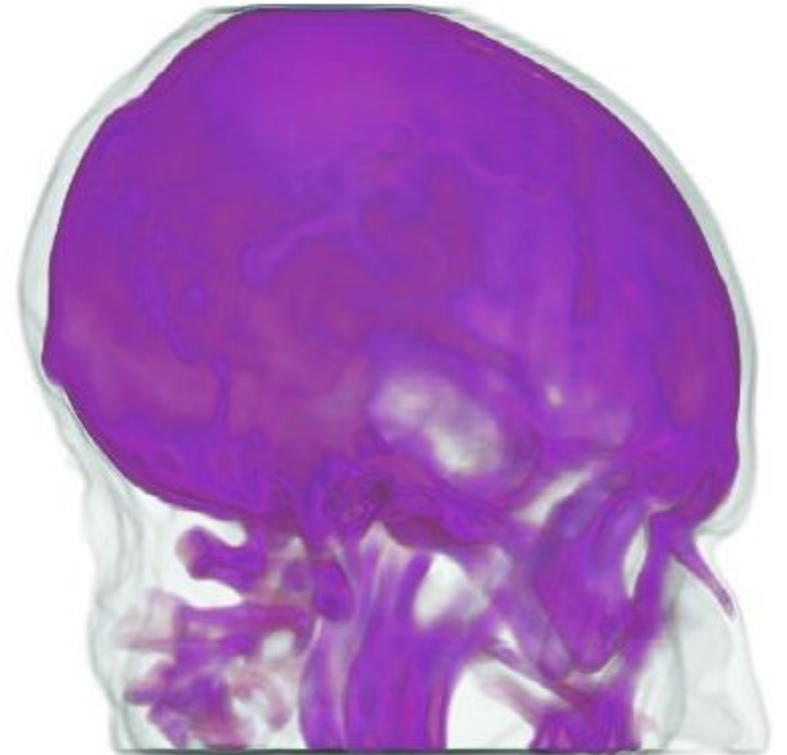
3D textures - lightning

- Phong lightning model



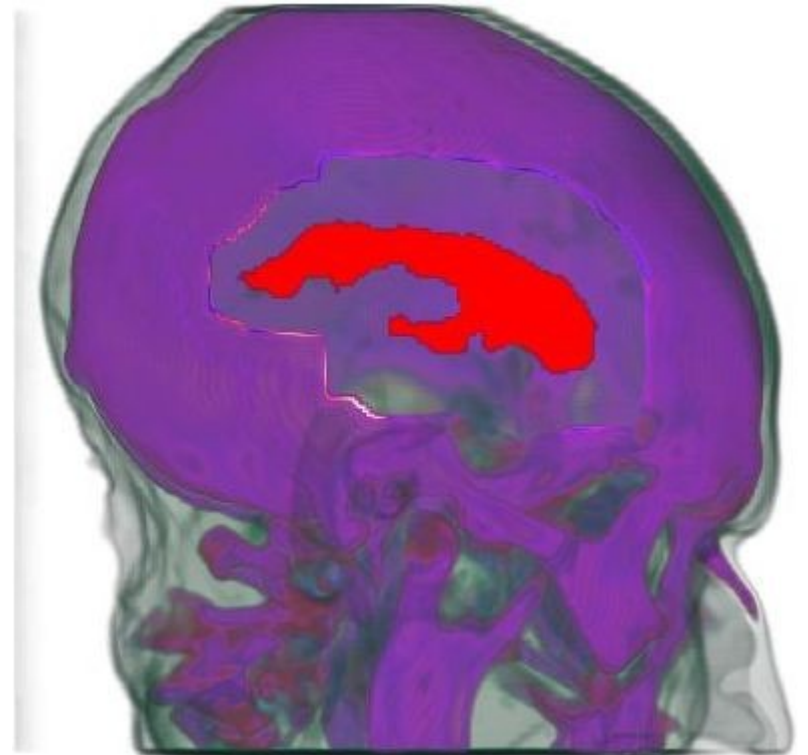
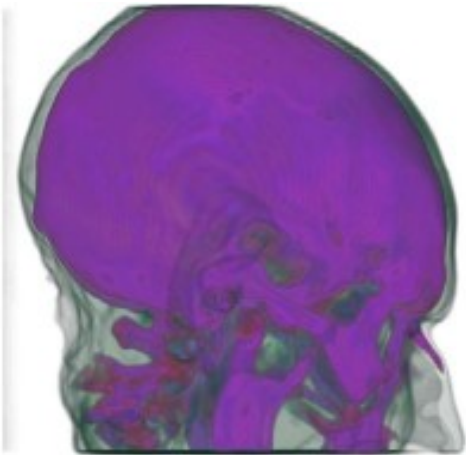
3D textures gradient modulation

- Suppress homogenous areas
- Normalized gradient magnitude
- Separate texture

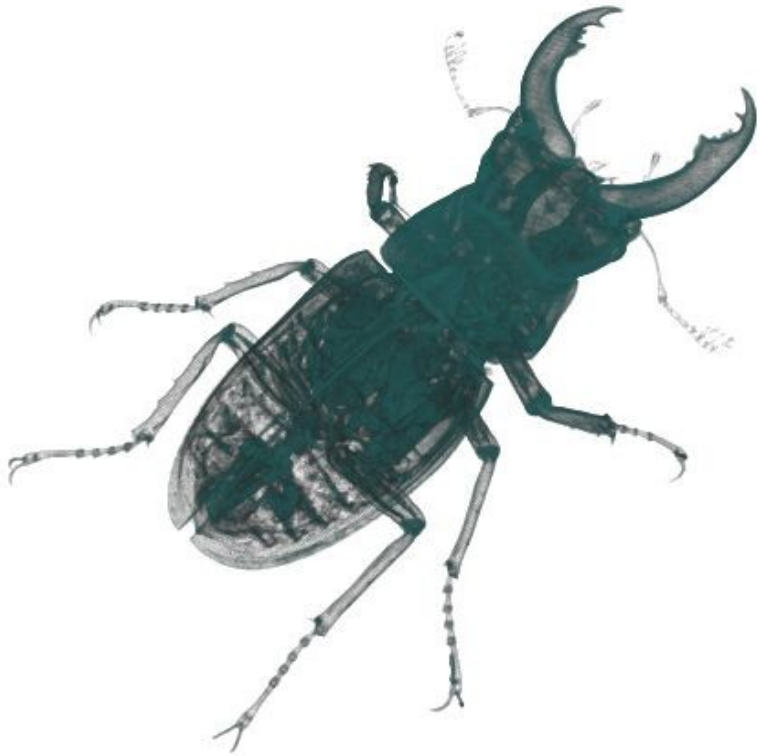


3D textures focus & context

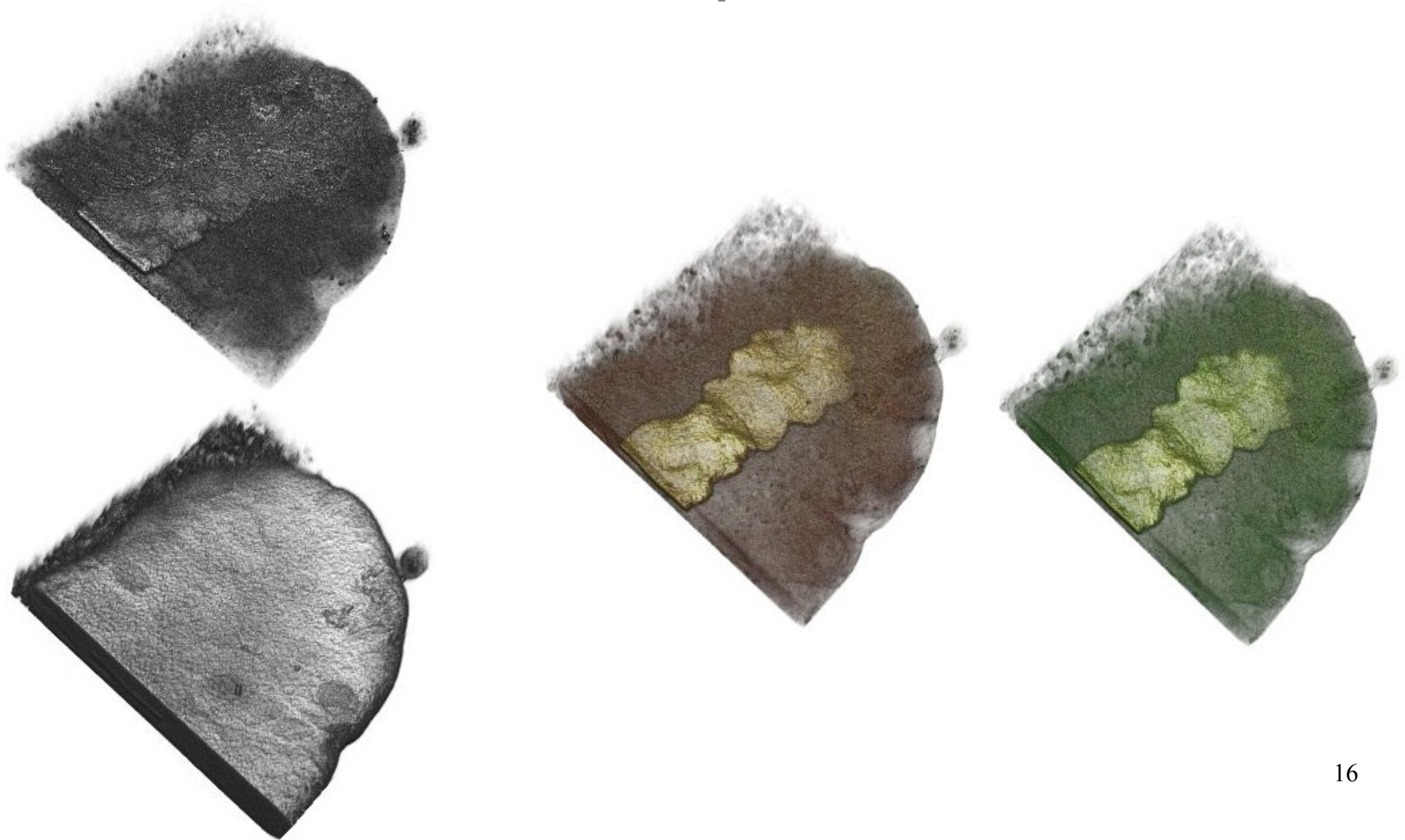
- Volume clipping due to mask shape
- Data + mask – same resolution



Rendering modes

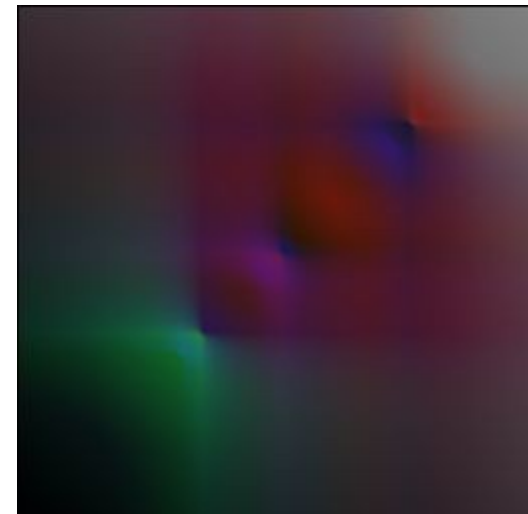
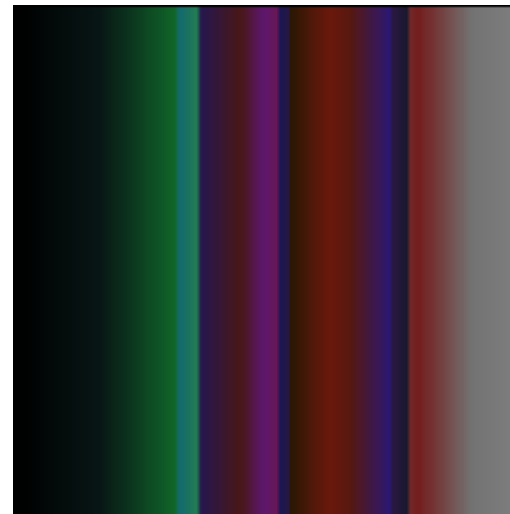
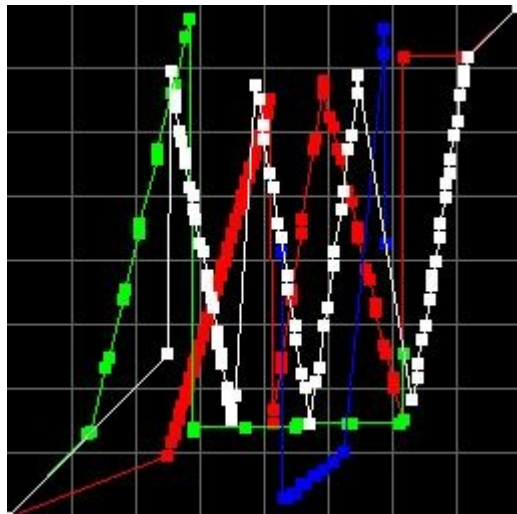
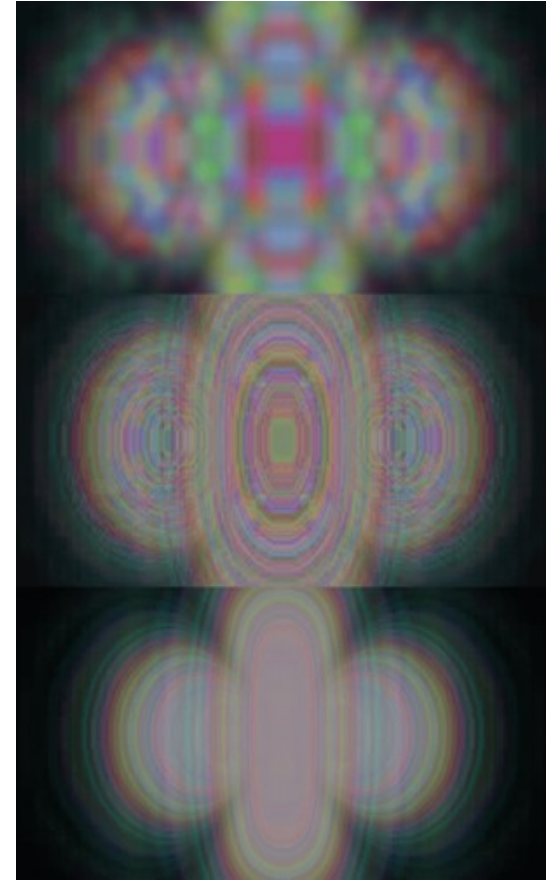


Rendering modes multi-spectral



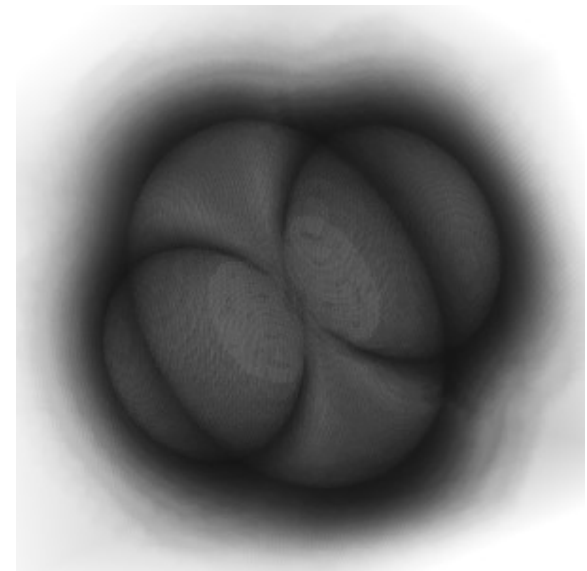
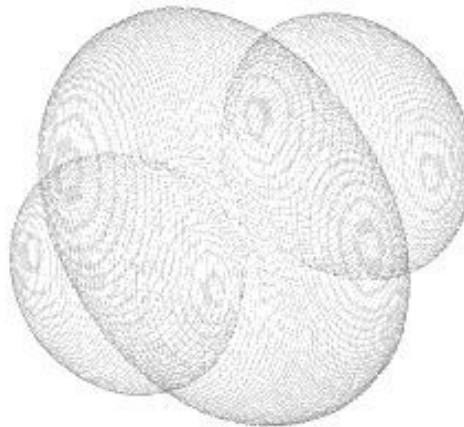
Classification

- Pre (old hw), Post, Pre-Integration
- Support for 8/12bit lookup tables
- Simple editor
 - Linear, bezier, free hand functions
 - Load, save
 - Histogram



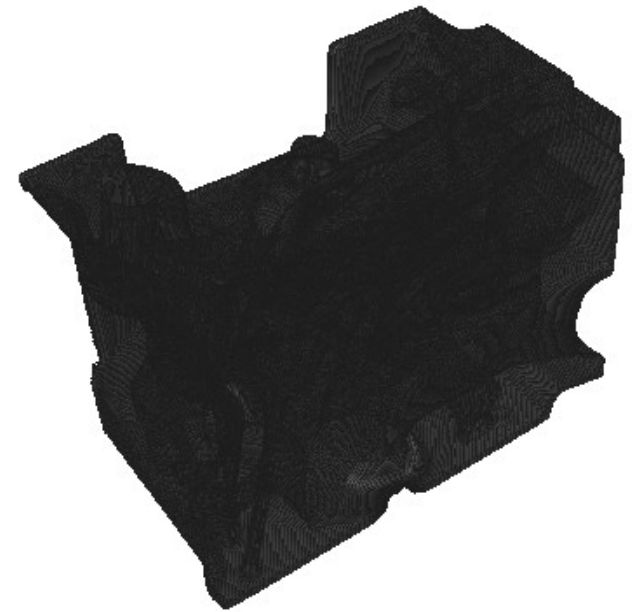
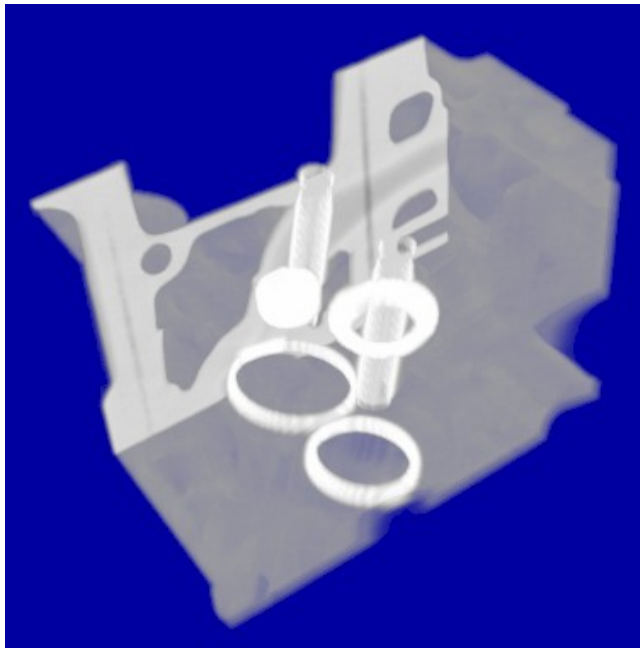
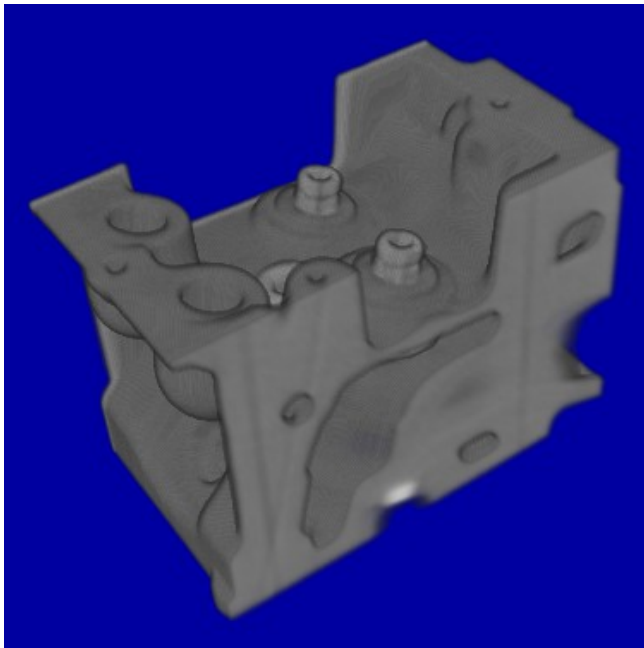
Settings

- Slice number controller (sampling)
- Alpha test ($>$, $=$, $<$) - iso surface
- Multi-spectral – gradient, alpha channel
- F&C – scale of cut



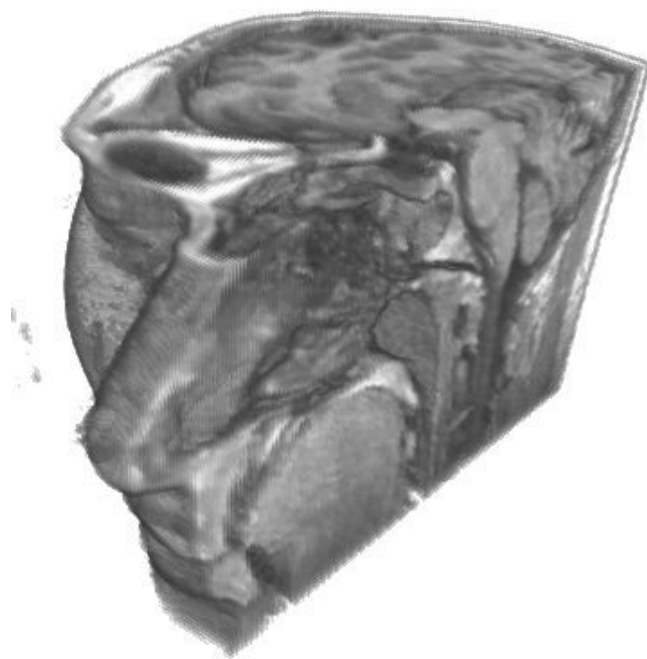
Blending

- Additive blending
- Maximum / Minimum intensity projection



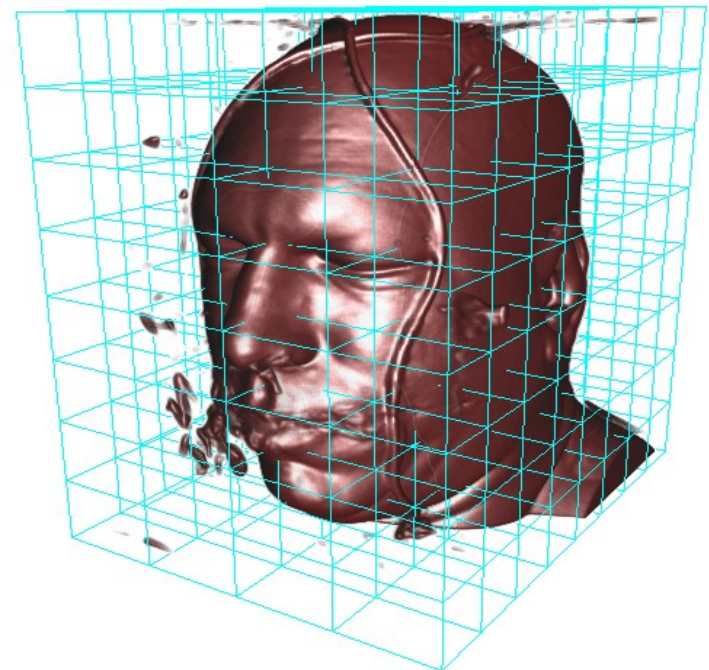
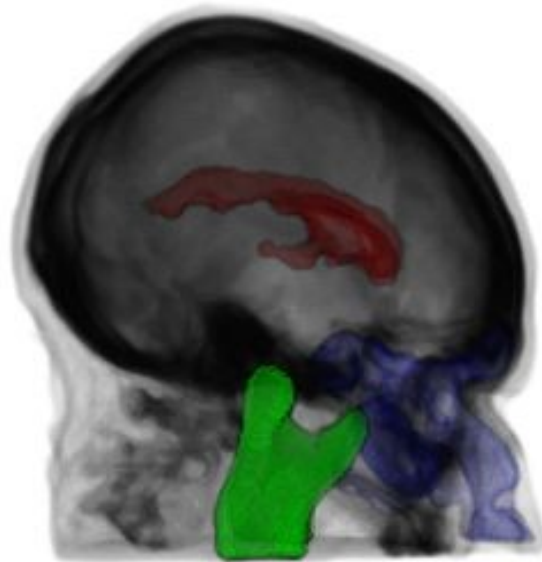
Clipping planes

- Standard OpenGL support
- Maximum 6 clipping planes (hw dependent)
 - Rotate, Translate, Draw, Invert
- Not for modes based on ray-casting



Other

- GPU information (extension, resolution)
- Data information
- Perspective / Orthographic projection
- BBox visibility, dataset visibility



Thank you
and
short demonstration.

