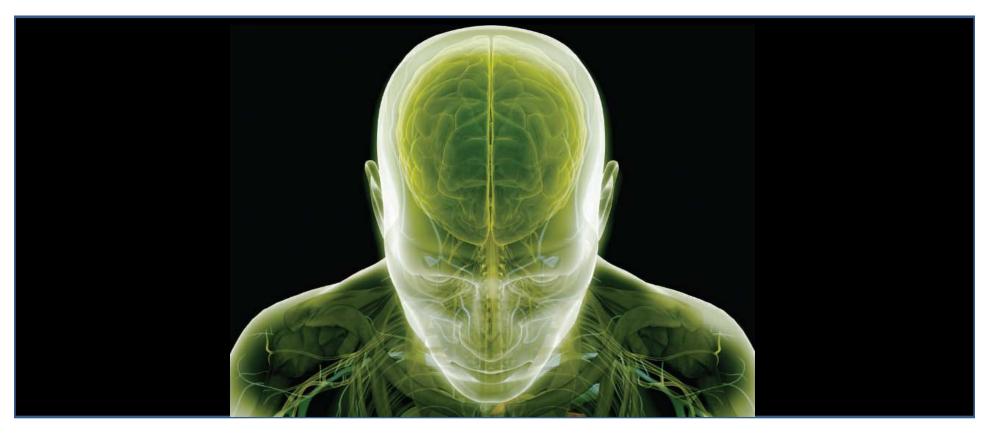


3D Visualization Algorithms Using VTK



Teodora SZASZ Faculty of Electronics, Telecommunication and Information Technology

Objective

Understand and implement the techniques used for medical image visualization (especially in neuroscience domain)



Contents

Techniques and Tools
2D Visualization Methods
3D Visualization Methods
Conclusions

Techniques and Tools

Common acquisition methods:

Computed Tomography (CT)

Magnetic Resonance Imaging (MRI)

Medical format: DICOM

Why it is not good to use DICOM in 3D visualization?

Implementation: *VTK

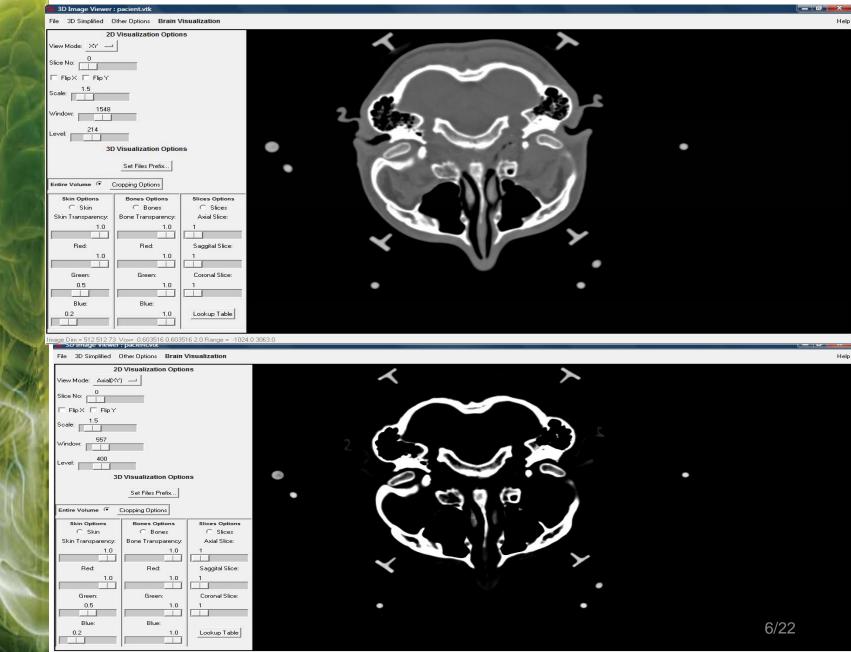
***Tcl /Tk scripting language**

*VTK – Visualization Toolkit *Tcl/Tk – Tool Command Language

2D Visualization

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Window and Level Adjustments



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3D Medical Visualization Algorithms

• Main methods of volume rendering in medical visualization:

Indirect volume rendering

- Plane-based volume rendering ("the cine mode")
- Surface-based volume rendering

Direct volume rendering

- Ray Casting Algorithm
- Shear Warp
- Texture-Mapping

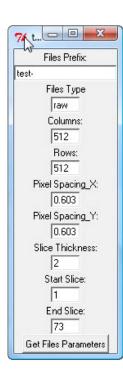


Converting DICOM to RAW

Transform DICOM format into RAW format

Reading the files

interface:



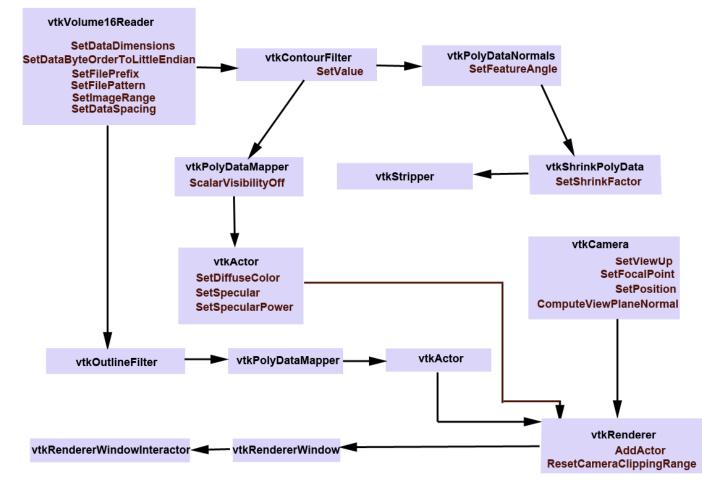
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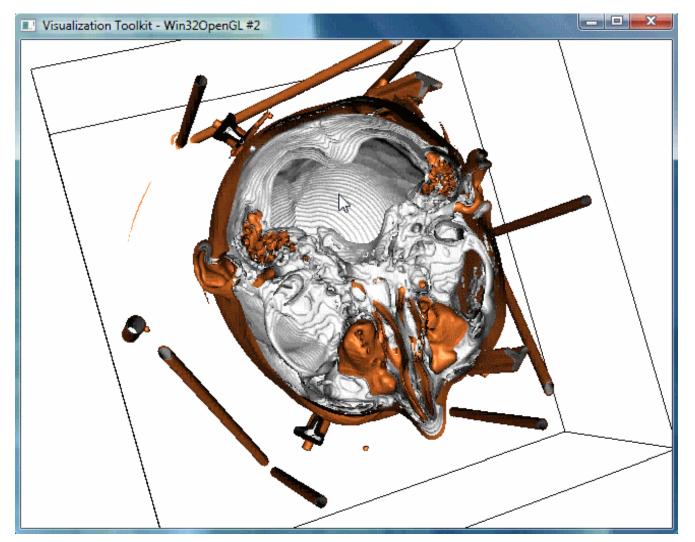
Isosurface Extraction

• VTK Classes used for Isosurface Extraction:





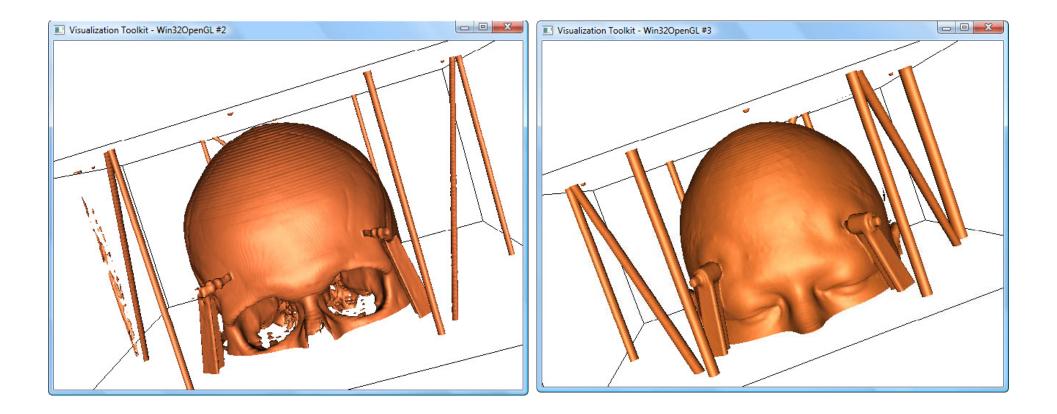
Bones and Skin Extraction



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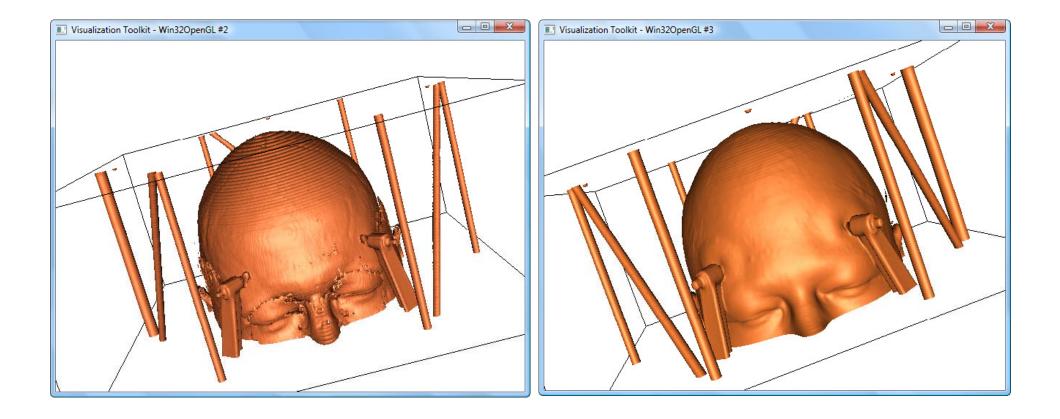


Isosurface Extraction: Skin Extraction DICOM (isovalue = 500) versus RAW (isovalue=500)



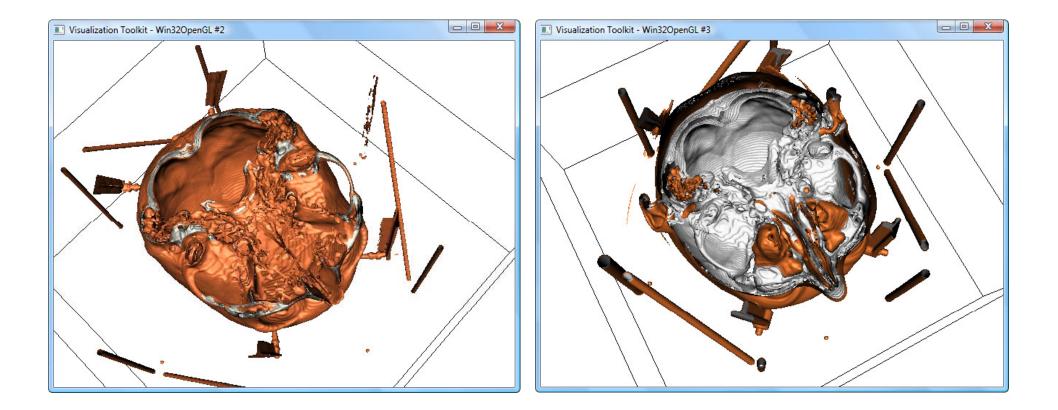


Isosurface Extraction: Skin Extraction DICOM (isovalue = 100) versus RAW (isovalue=500)



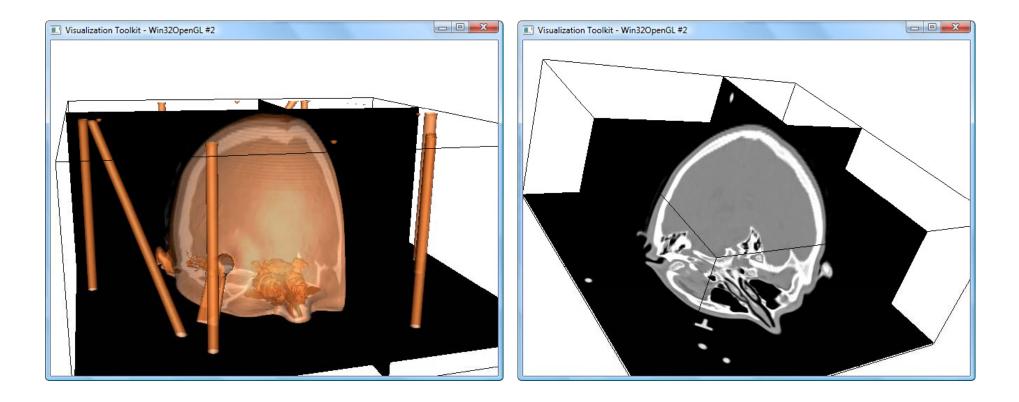


Isosurface Extraction: Bones Extraction DICOM (isovalue = 1250) versus RAW (isovalue=1250)





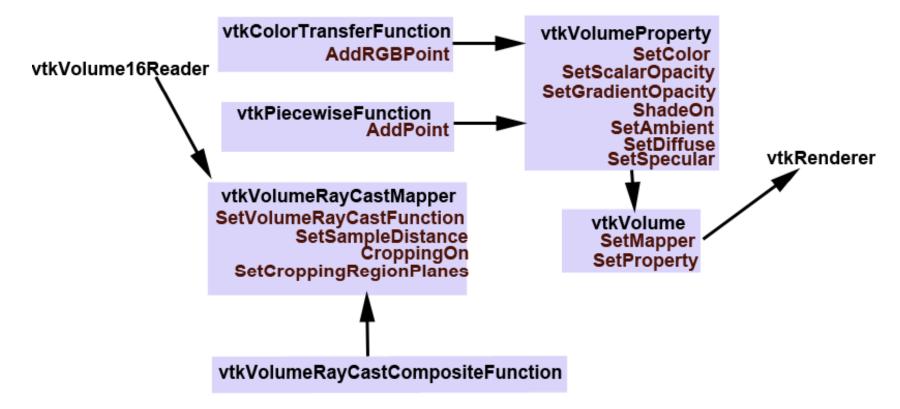
Volume Visualization Including the Orthogonal Planes





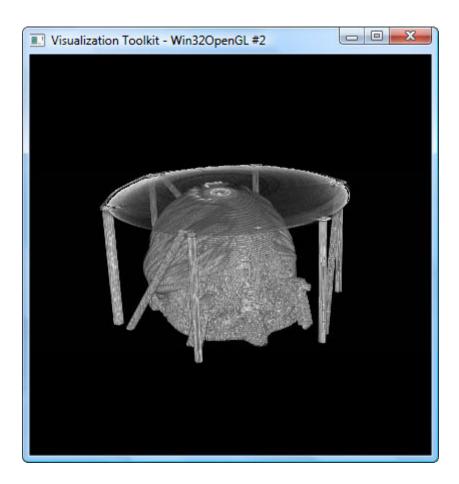
Direct Volume Visualization

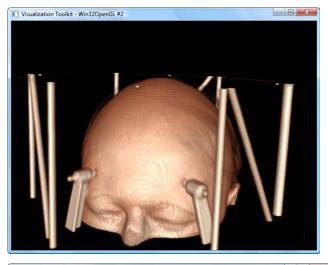
>VTK Classes used for Direct Volume Visualization:

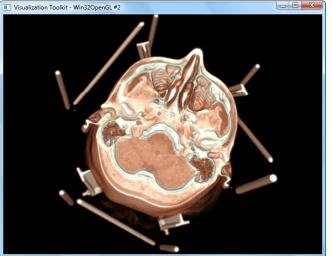




Direct Volume Visualization DICOM versus RAW



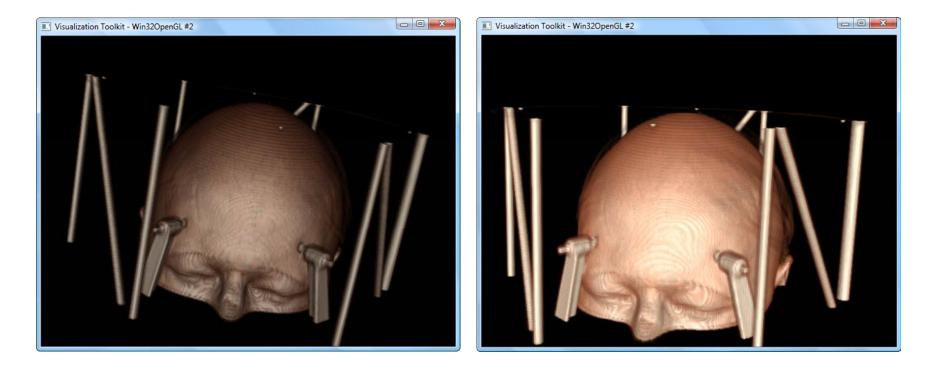




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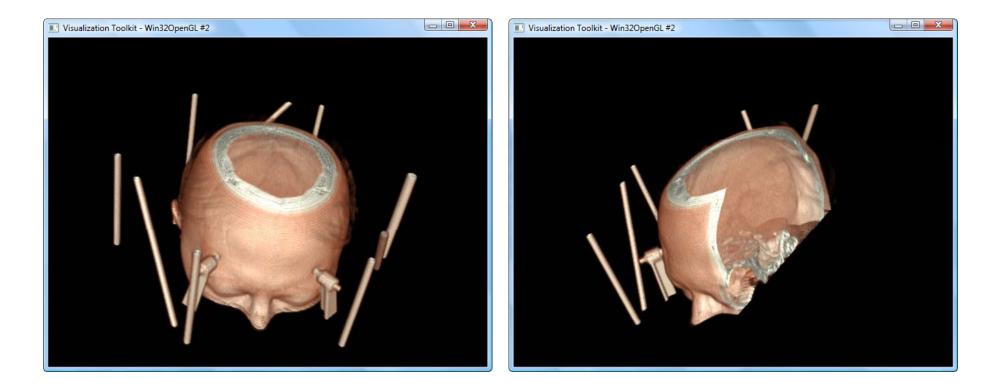


Direct Volume Visualization VTK 5.6 versus VTK 5.4



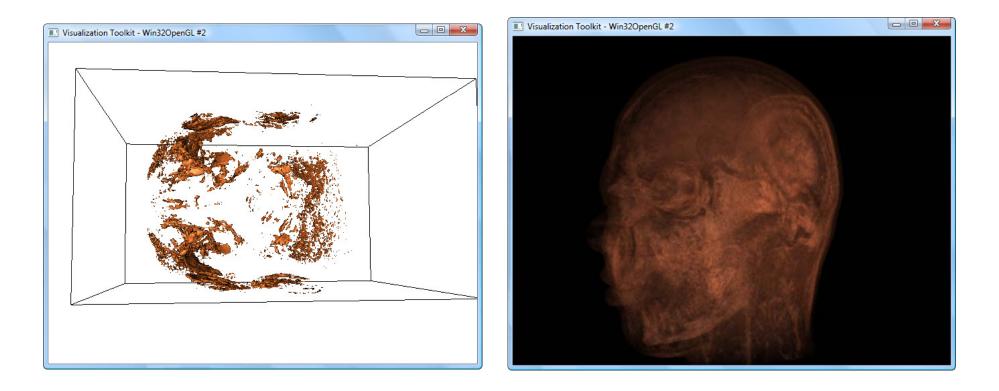


Cropping Options





Using MR dataset (skin extraction and direct volume visualization)



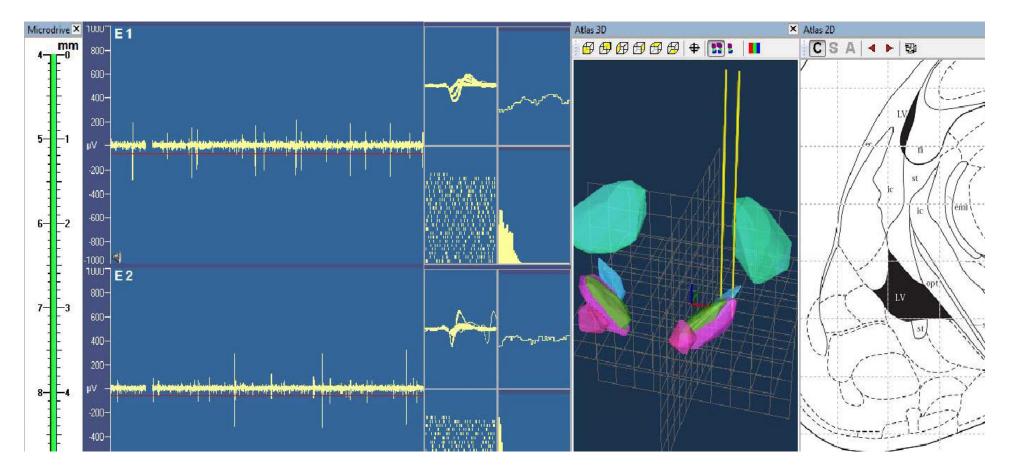
Conclusions

> medical imaging visualization

How to improve volume rendering?
Neurosurgery planning software



Neurosurgery Planning Software – Example for the future work





THANK YOU!

