Abstract Title: Demonstration of different segmentation and visualization techniques by means of a complex real world object exemplified by a Christmas tree

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Presentation#/Poster#: C-0965

Purpose: To demonstrate the properties of different advanced rendering techniques for the visualization of complex three-dimensional objects, using a Christmas tree as an example.
Methods: A Christmas tree was scanned with multiple detector-row CT (4 x 1 mm detector configuration, 0.5 mm section spacing). Various segmentation techniques, such as threshold and labelling, watershed-algorithms and region growing-methods were applied in combination with morphological and Boolean operators. The segmented objects as well as the original density information were visualized using MIP, volume-rendering, CPR, SSD, virtual endoscopy (arboroscopy) and non-photorealistic volume rendering. Different properties of the underlying visualization algorithms (i.e. ray-casting, ray-tracing, shear-warp, hardware accelerated, and OpenGL based visualization) were investigated. A video display of the examples was generated.
Results: Taking advantage of cutting edge postprocessing and visualization methods resulted in an unprecedented level of quality and speed. Some of these properties, such as overall appearance, performance, preservation of fine details, and artefacts, were evaluated and demonstrated in comparison to the real features of the original Christmas tree.
Conclusion: Advanced three-dimensional rendering of high-resolution volumetric CT datasets allow a near-real-world display of complex three-dimensional objects. This work furthermore illustrates the flexibility and robustness of algorithms mainly used in medical imaging.