# EFFICIENT MIRRORING OF VOLUME DATA BY AN ARBITRARY PLANE FOR MAXILLO-FACIAL SURGERY

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*Purpose*

In the field of maxillo-facial surgery, determining symmetry and finding differences between symmetrical features is often required. The central aspect of a symmetry-based method for intervention planning is to properly mirror bone structures within volume data. In order to perform this operation, an arbitrary symmetry plane has to be defined according to the position and orientation of the anatomy. Several algorithms for computing this transformation can be conceived. They have diverse characteristics in terms of speed and accuracy of the produced results. In particular it should be noted that naive approaches do not provide sufficient performance for desired user interactivity.

*Material and Methods*

A software framework for testing various mirroring algorithms has been implemented. This framework provides functionality for loading volumes, defining symmetry planes and computing the transformed volume. Algorithms can be supplied in a plugin-like fashion. Two different approaches for mirroring have already been designed, implemented and tested. The first consists of directly applying the transformation to voxel positions and computing a trilinear interpolation afterwards. The second approach is based on a modified 3D Bresenham line drawing strategy. For each voxel span in the original volume it computes a corresponding 3D line in the mirrored volume and directly assigns the voxel intensities. In order to benchmark the accuracy and speed of the different algorithms, measurement facilities have been incorporated into the framework.

*Results*

Several volume datasets have been processed using the algorithms. These have proven to have different characteristics regarding computation speed and visual quality. This makes them suitable for either fast interaction (3D Bresenham) or generation of high-quality results (trilinear interpolation).

*Conclusion*

The described algorithms will be applied as a part of a planning tool for orbita reconstructions in the field of maxillofacial surgery. The large and growing size of datasets produced by CT scanners increases the need for high-performance mirroring. The improved performance of the mirroring operation indicated by our results makes a better interactivity possible.

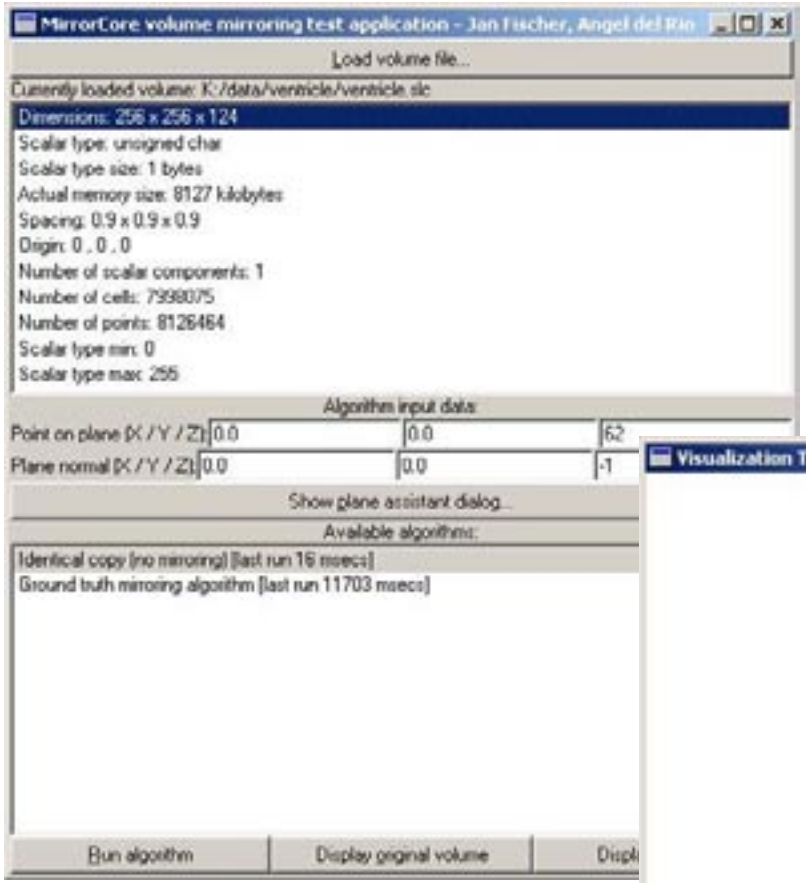
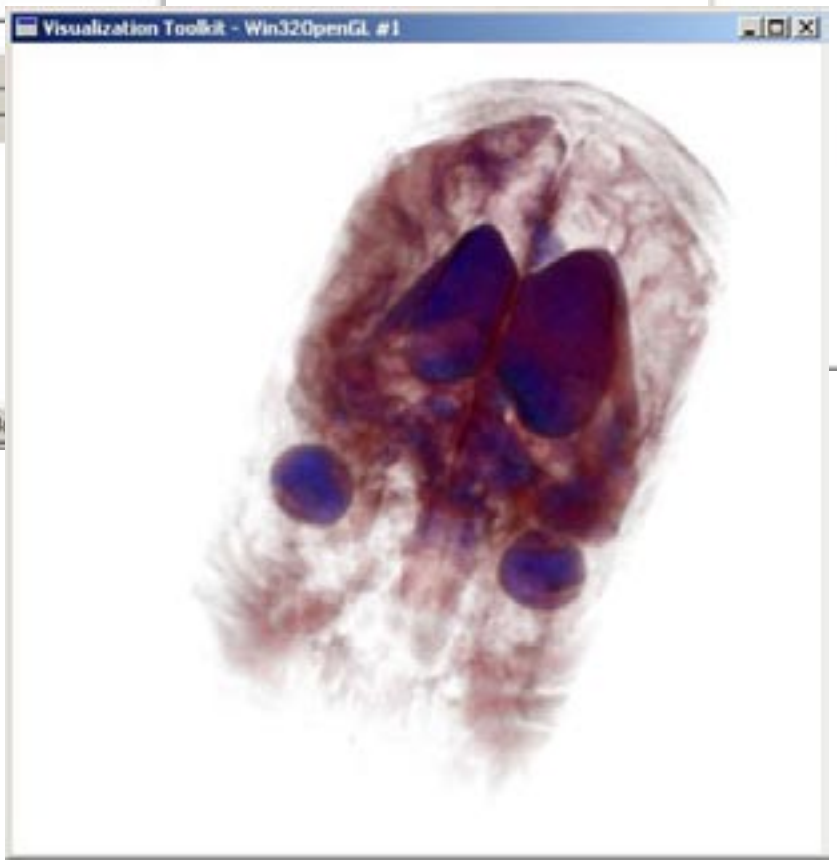



image 1

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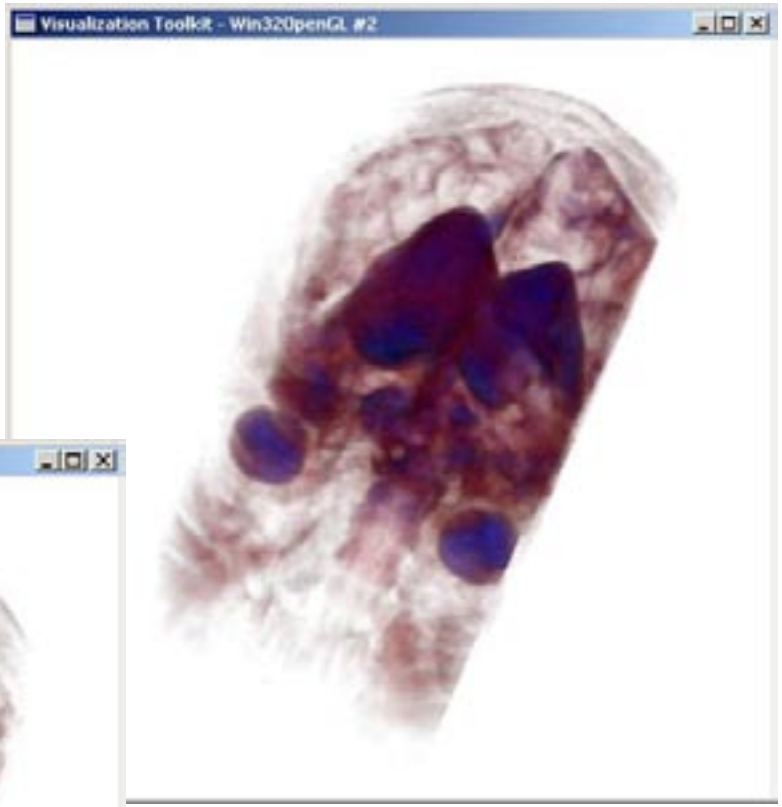


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